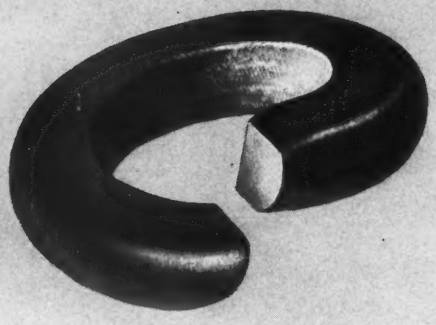
CONTROLLED BEARING

Reliance HY-CROME *Spring Washers*



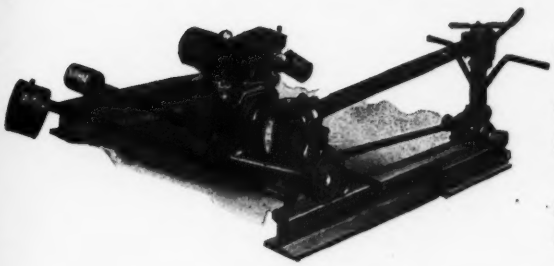
LOCOMOTIVE HY-CROME

● LOCOMOTIVE HY-CROME *Spring Washers* are made to exacting specifications and results of service tests have proved their efficiency. They insure dependable and economical engine performance with maximum operation at a minimum upkeep expenditure. The more completely power is equipped with LOCOMOTIVE HY-CROME spring washers the lower the maintenance and the greater the mileage. Locomotives in the shop yield no revenue. The LOCOMOTIVE HY-CROME spring washer is a device scientifically manufactured and of proved merit. Our sales engineers will gladly supply additional information.

EATON MANUFACTURING COMPANY
RELIANCE SPRING WASHER DIVISION
MASSILLON, OHIO

Locomotives are subject to torsional strain, stress, vibration and wear—causing bolt looseness. LOCOMOTIVE HY-CROME Spring Washers automatically compensate for this condition.

Raco Power Track Machine

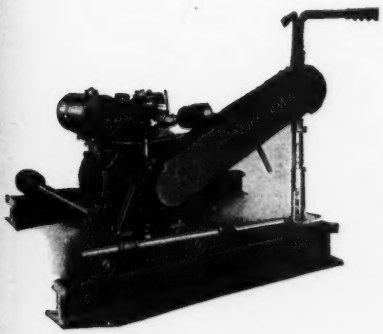


Over 300 on 50 railroads have established remarkable records for economy.

Ease of operation, light weight, automobile type construction **insure maximum speed and minimum service interruptions.**

Tightening out-of-face with the Raco lasts several times as long as hand tightening and insures **uniform tension on all bolts.**

Raco Tie Boring Machine



Bores holes for **screw** spikes or **cut** spikes.

Bores ties in track more than **twice as fast** as any other accepted means.

Bores holes **absolutely vertical.**

Locates all holes **exactly in center** of tie plate punching.

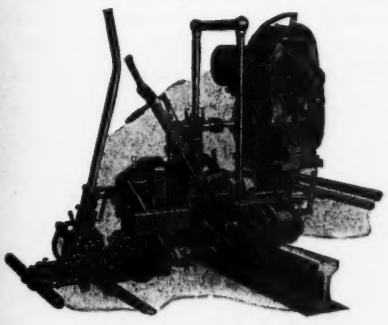
Automatically **controls depth** of hole.

Chips are blown away as fast as made, leaving hole clear.

One-man operation.

Machine can be removed from track by one man.

Everett Power M-W Machine



For ten years the Everett M-W has been the **standard** power rail drill on practically all railroads.

Its design and construction insure the utmost in facility of operation and in speed and accuracy of adjustment.

It has made such astonishing records for economy that **no road can afford to use any other means for drilling bolt holes.**

RAILROAD ACCESSORIES CORPORATION

MAIN OFFICE

405 LEXINGTON AVENUE

(Chrysler Building)

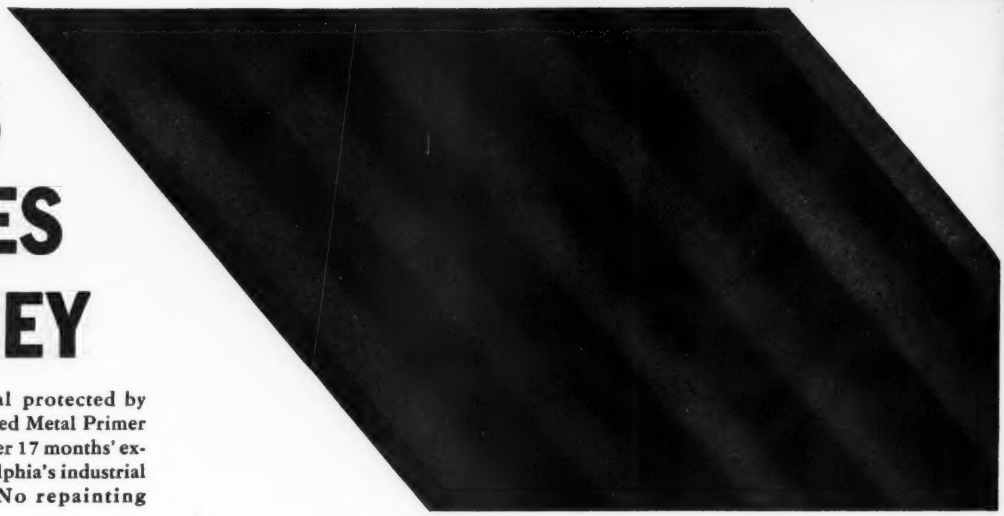
NEW YORK

Published monthly by Simmons-Boardman Publishing Corporation, 105 W. Adams St., Chicago, Ill. Subscription price, United States and Possessions, and Canada, $2.00; Foreign $3.00. Single copies 35 cents. Entered as second-class matter January 20, 1933, at the postoffice at Chicago, Illinois, under the act of March 3, 1879, with additional entry at Mt. Morris, Ill., postoffice. Address communications to 105 W. Adams St., Chicago, Ill.

THIS WASTES MONEY

This sight is all too familiar to maintenance men. It means repainting—because the ordinary primer couldn't hang on. 17 months' exposure in Philadelphia area.

THIS SAVES MONEY



Galvanized metal protected by Du Pont Galvanized Metal Primer photographed after 17 months' exposure in Philadelphia's industrial surroundings. No repainting needed *here.*

DU PONT GALVANIZED METAL PRIMER STICKS TO ITS JOB!

MAINTENANCE MEN know it's the *long-haul* protection that keeps overhead down.

And long-haul protection is Du Pont Galvanized Metal Primer's *long suit!*

Easy to apply, too. On new or weathered metal, all that's necessary is to clean grease from the surface. No copper sulphate or other acid treatments are necessary.

With Du Pont Galvanized Metal Primer, galvanized structures are safer from the attacks of weather, acid fumes, smoke and soot for much longer periods before repainting is needed.

Our representative will be glad to give you full information on how this outstanding primer gives better protection for a longer time at lower cost. E. I. du Pont de Nemours & Co., Inc. Finishes Division, Wilmington, Delaware.

DU PONT
REG. U. S. PAT. OFF.

TRANSPORTATION FINISHES

MEASURE YOUR PAINT COST BY THE *performance yardstick*—

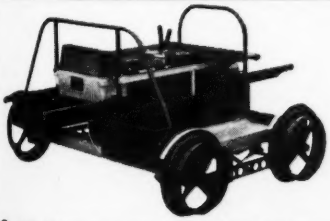
PERFORMANCE ON THE JOB COUNTS

59-SERIES C

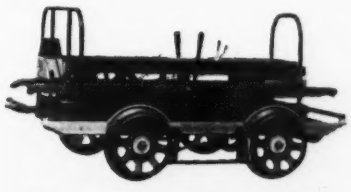
ONE-TO-TWO-MAN INSPECTION CAR . . . LIFT 108 POUNDS

Original in design, the Fairmont 59 has won enthusiastic endorsement for its unbeatable performance . . . its economical operation and low maintenance . . . its safety and unfailing dependability. It embodies advanced features which are found in no other car. The extra large tray—45″ x 27″—holds all of the battery material a signal maintainer requires. Unlike so-called "side-load" cars, the 59 has the weight of engine and load well centered between the rails and the power is applied evenly to both rear wheels . . . safety features that make the 59 hang to the rails, even on sharp turns and at maximum speeds. Emergency set-offs can be handled easily by one man. Lift handles extend front or rear. Rail skids permit sliding the car quickly over the highest rails. Powered by the same famous 8 H. P. engine as used on the Fairmont aluminum frame M9, M14 and M19 and the steel frame M14 and M19 cars, the 59 has ample pull for capacity loads with a full size windshield. Fairmont Railway Motors, Inc., Fairmont, Minnesota.

Inspection Motor Cars . . . Section Motor Cars . . . B & B and Extra Gang Cars . . . Gas-Electric Ditchers . . . Shapers . . . Ballast Cleaners . . . Ballast Drainage Cars . . . Mowers . . . Weed Burners . . . Extinguisher Cars . . . Power Cars: Air, Electric, Paint Spray, Tie Tamping . . . Rail Coaches . . . Motor Car Engines . . . Push Cars and Trailers . . . Roller Axle Bearings . . . Wheels and Axles.



● M9 Series B—One-Man Inspection Car—Aluminum. Lift 85 Pounds.



● M14 Series D—Light Section Car—Aluminum. Lift 96 Pounds.

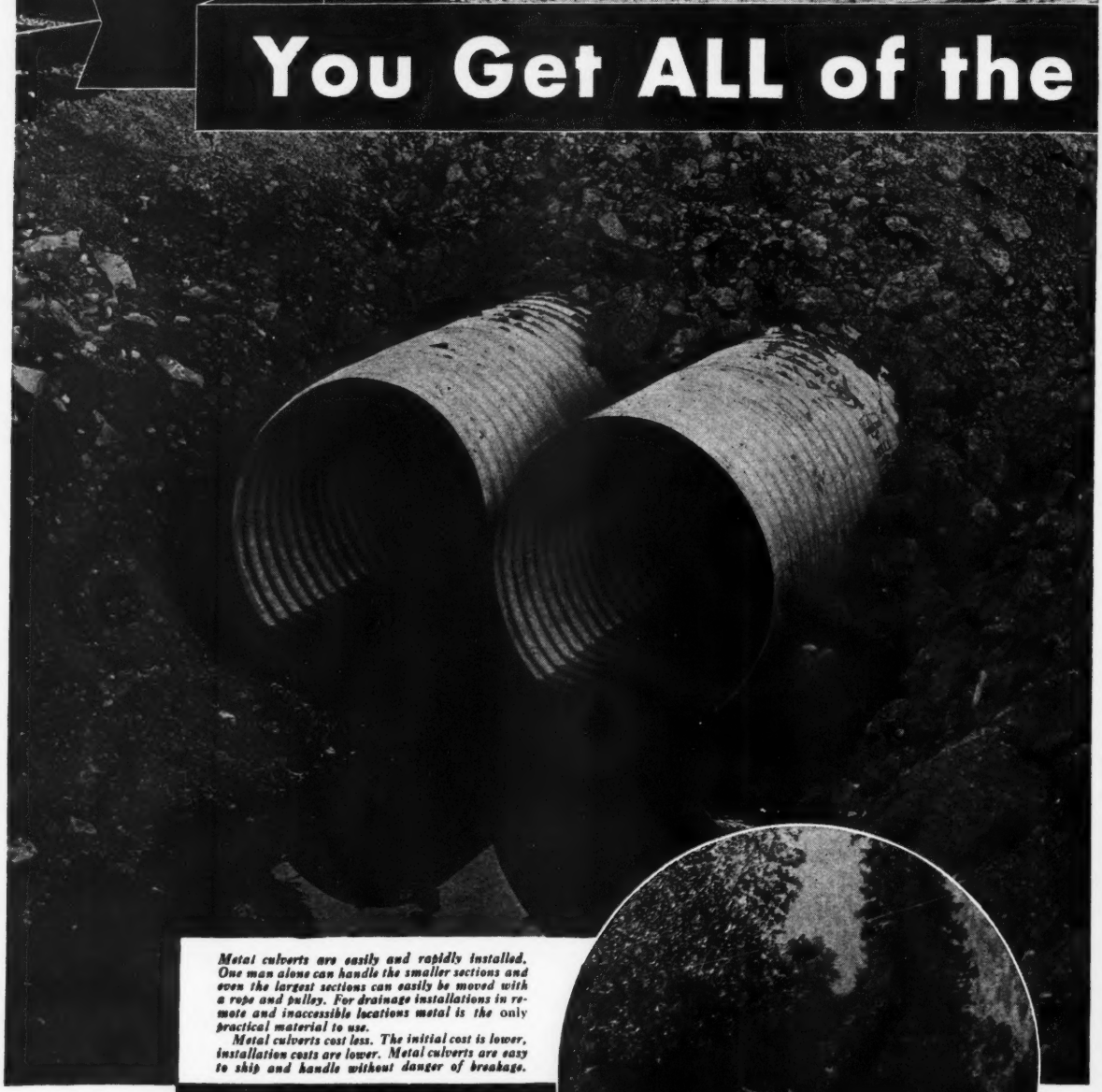
● M19 Series D—One-to-Four-Man Inspection Car—Aluminum. Lift 96 Pounds.

FALL THE RAILWAY MOTOR CARS IN SERVICE TODAY

Fairmont

More than Half are Fairmonts

You Get ALL of the



Metal culverts are easily and rapidly installed. One man alone can handle the smaller sections and even the largest sections can easily be moved with a rope and pulley. For drainage installations in remote and inaccessible locations metal is the only *practical material to use.*

Metal culverts cost less. The initial cost is lower, installation costs are lower. Metal culverts are easy to ship and handle without danger of breakage.

When You Specify Culverts Made From USS Copper Steel

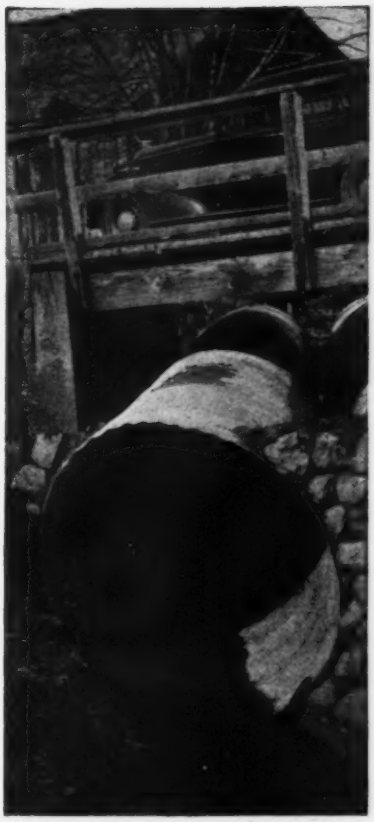
Advantages of METAL

EVERY material from which culverts are made claims some advantage. You get more of these advantages when you use metal, but when you specify that the culverts you buy be made from USS Copper Steel, you get everything that is required of culverts plus ALL of the advantages of metal.

Today, the world builds with steel. For wherever economy of time, labor and money is important, there you will find steel firmly established. Steel simplifies design, reduces structural weight, increases strength. It is adaptable, easy to handle, and extremely durable.

USS Copper Steel Sheets for culverts are a product of the laboratory as well as the steel mill. We make and sell USS Steel Sheets of other analyses for the fabrication of culverts, but for drainage purposes we recommend the use of USS Copper Steel; yet you pay no premium for the extra advantages offered by culverts made from this metal.

USS Copper Steel Culvert Sheets are galvanized for added protection against corrosion. They are given a heavy, even coating of commercially pure zinc which is applied by a hot-dip galvanizing process. As long as the zinc coating endures neither time nor weather can attack the sheet it covers.



Metal culverts solve the problem of traffic delay. A few years ago it was impossible to install a culvert without interrupting traffic, or tearing up the road surface. Today, metal culverts make quick installations easier, quicker. A steady flow of traffic is permitted while the work is being done.

USS COPPER STEEL CULVERT SHEETS

CARNEGIE-ILLINOIS STEEL CORPORATION, *Pittsburgh and Chicago* · COLUMBIA STEEL COMPANY, *San Francisco* · TENNESSEE COAL, IRON & RAILROAD COMPANY, *Birmingham*

UNITED STATES STEEL PRODUCTS COMPANY, New York, *Export Distributors*

UNITED STATES STEEL

The EXTRA things the Timken Company does to give extra value and extra service to users of TIMKEN Bearings

When the railway equipment manufacturer buys TIMKEN Bearings he gets more—a great deal more—than a box of bearings and an invoice. He gets the tremendous benefits of the many extra things The Timken Roller Bearing Company does to put extra quality, extra accuracy and extra life into TIMKEN Bearings—*and so does the equipment buyer.*

A section of the main testing room of the new Timken Physical Laboratory.

The New Timken Physical Laboratory

Scientific research and testing have always been important factors in TIMKEN Bearing production and application. Never before in the history of the bearing industry, however, have there been any research and testing facilities to match those of the new Timken Physical Laboratory.

Housed in a specially constructed building entirely apart from the main factory is the greatest array of research and testing apparatus ever assembled for its specific purposes. A tremendous investment in apparatus—including many specially designed machines and instruments to be found nowhere else.

In this new laboratory with its ultra modern equipment and revolutionary methods, any operating condition can be duplicated and every conceivable test carried through to a definite conclusion. Here exact knowledge is the rule in every problem of anti-friction bearing application and operation. Furthermore, the scope of the work is not strictly confined to the bearings themselves, but extends to the testing of many parts and materials upon which the full success and satisfaction of any particular bearing application may ultimately depend.

THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO

TIMKEN

TAPERED ROLLER BEARINGS

Eliminate Maintenance with WELDED PIPING SYSTEMS

Notice how easily welded piping can be nested compactly in small spaces. Piping for this railroad oil storage station was fabricated by welding under Oxweld Railroad Service supervision.

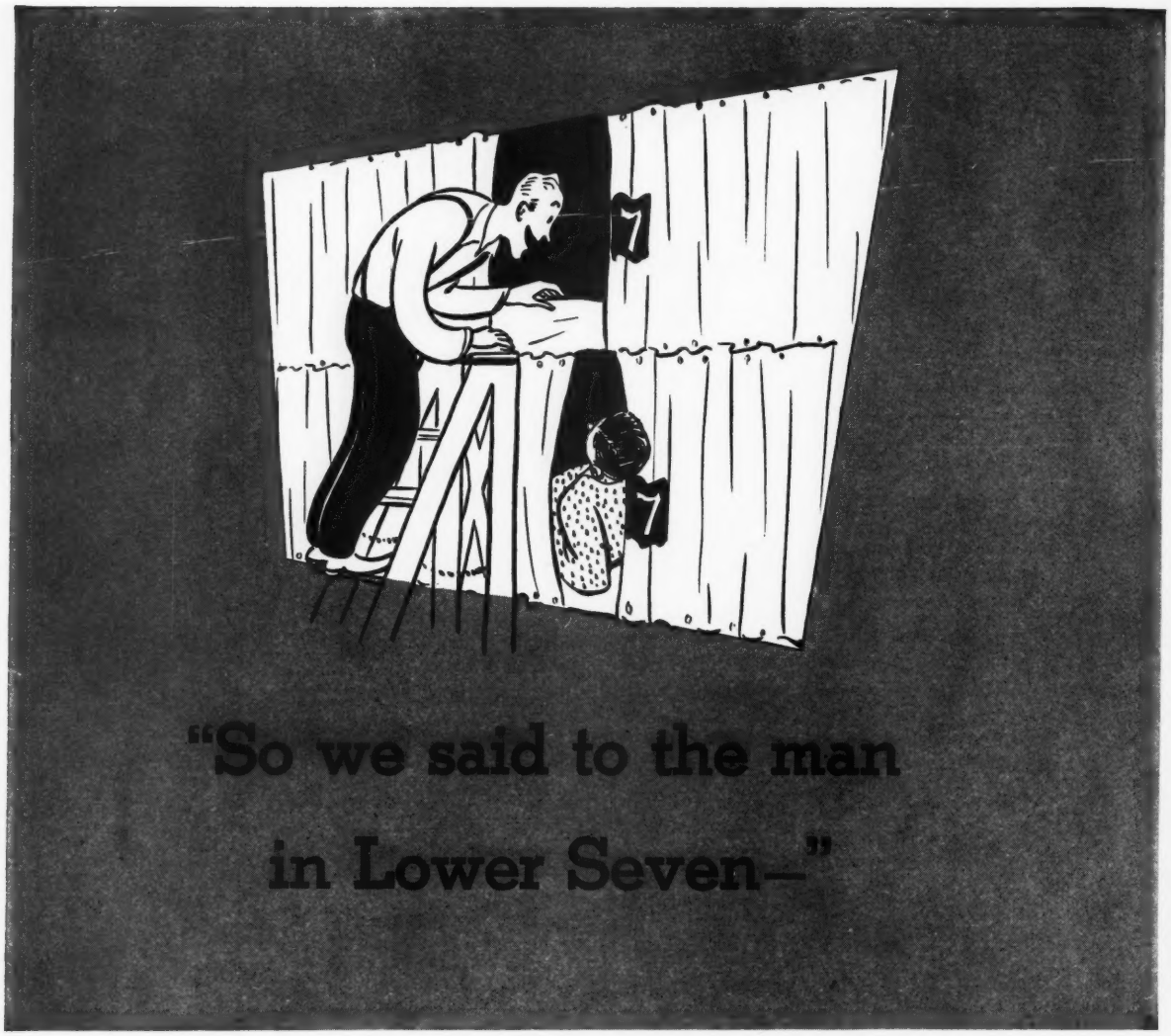
WHEN piping systems are properly oxy-acetylene welded, the full strength of the pipe is utilized, leaks are permanently eliminated, and the pipe joints are free from trouble or maintenance.

Railroads are rapidly accepting this economical method of installing all types of piping systems: air, water, steam, oil and gas, and other services.

The Oxweld Railroad Service Company has pioneered in the development of welded piping for railroads. This organization, through its practical railroad experience along many such lines, has retained a position of leadership in the steady improvement of materials and procedures for oxy-acetylene welding and cutting. Because of this progress, it will pay you to consult Oxweld Railroad Service frequently concerning your work.

OXWELD RAILROAD SERVICE
1912-1937
A QUARTER OF A CENTURY OF SERVICE TO THE MAJORITY OF [illegible]

THE OXWELD RAILROAD SERVICE COMPANY
Unit of Union Carbide and Carbon Corporation
NEW YORK: Carbide and Carbon Bldg.
UCC
CHICAGO: Carbide and Carbon Bldg.



● The man in Lower Seven thought he knew all about Fairbanks-Morse. It meant Diesels, motors, pumps, and scales to him.

"Mister," said we, "our engine takes on water at the next stop. That's from an F-M standpipe —and the water is delivered by an F-M turbine pump. Our coal was put on at an F-M coal chute. There's an F-M axle generator under this car, charging batteries and furnishing current to F-M motors, which keep this air conditioning system going. Fairbanks locomotive scales weighed this engine wheel by wheel. This track and this block signal system are patrolled by men in F-M motor cars. The station in the next town gets its light and power from an F-M Diesel plant. F-M portable motor generators fully charged the batteries before the train left the terminal. And if I had time I could think of a dozen other places where Fairbanks-Morse serves the railroads."

For full information on any of these products, write today for Bulletin H-88. Address Fairbanks, Morse & Co., 900 S. Wabash Ave., Chicago, Ill.

6963-GA21.2

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DIESEL ENGINES • ELECTRIC MACHINERY
PUMPS • FAIRBANKS SCALES • RAILROAD
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F M

Railway Equipment

Smooth Track at low cost for *HIGH SPEED TRAINS*

Building up and heat treating rail ends the AIRCO way* is one of the most important operations performed by maintenance engineers of Airco railroad customers. It assures comfort to travellers, smooth handling to shippers, and efficiency and economy in maintenance programs to the railroads.

*The AIRCO way—Airco Oxygen and Acetylene, Airco Apparatus, and Engineering Assistance.

Our engineers would be glad to discuss railend welding and heat treating with you and furnish you with detailed cost data.

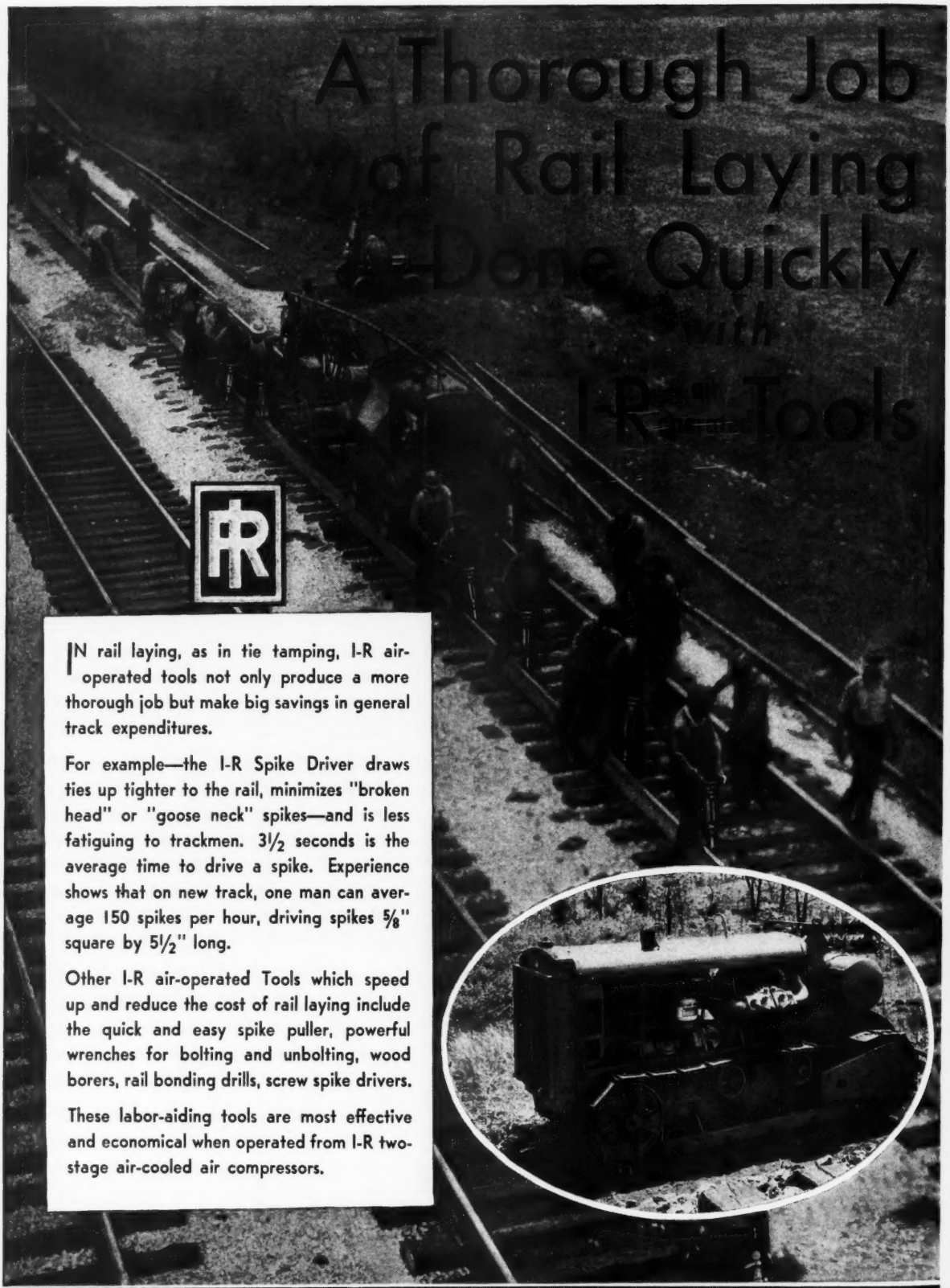
AIR REDUCTION

SALES COMPANY

General Offices: 60 East 42nd St., New York, N. Y.

DISTRICT OFFICES and DISTRIBUTING POINTS in PRINCIPAL CITIES

A NATION-WIDE WELDING SUPPLY SERVICE



IN rail laying, as in tie tamping, I-R air-operated tools not only produce a more thorough job but make big savings in general track expenditures.

For example—the I-R Spike Driver draws ties up tighter to the rail, minimizes "broken head" or "goose neck" spikes—and is less fatiguing to trackmen. 3½ seconds is the average time to drive a spike. Experience shows that on new track, one man can average 150 spikes per hour, driving spikes ⅝" square by 5½" long.

Other I-R air-operated Tools which speed up and reduce the cost of rail laying include the quick and easy spike puller, powerful wrenches for bolting and unbolting, wood borers, rail bonding drills, screw spike drivers.

These labor-aiding tools are most effective and economical when operated from I-R two-stage air-cooled air compressors.

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507-11

Why Not Build ALL YOUR TRACK "ON A LIVING ROOM FLOOR"

H. Armstrong Roberts

THINK HOW MUCH SIMPLER your track problems would be if your roadbed were *as dry and stable* as the floor in your living room.

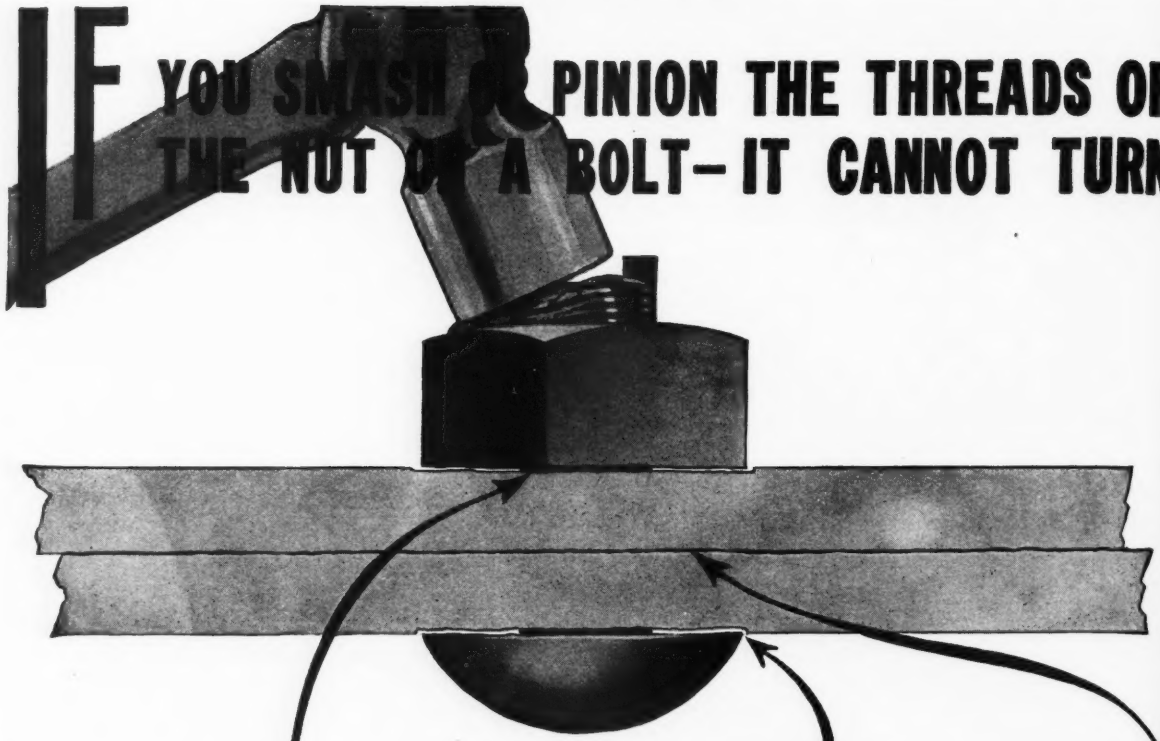
Besides eliminating slow orders, safety and passenger comfort would be improved. And your track maintenance costs would be permanently reduced.

While all this may sound like a dream, many leading railroads today are achieving these same results — through *systematic programs of subdrainage*. Why not call in an experienced Armco engineer and find out what subdrainage can do for you — in terms of a faster, smoother, more economical roadbed? Your inquiry addressed to our nearest office will receive prompt and personal attention. Ingot Iron Railway Products Company (Member of the Armco Culvert Mfrs. Assn.), Curtis Street, Middletown, Ohio; Berkeley, California; Philadelphia, Dallas, Atlanta, Salt Lake City, Minneapolis, Los Angeles, St. Louis, Portland, Cleveland, Spokane, Chicago, Richmond, Houston, Denver.

ARMCO

ARMCO PERFORATED PIPE

IF YOU SMASH OR PINION THE THREADS OF THE NUT OF A BOLT—IT CANNOT TURN



but then you cannot tighten the nut down when inevitable wear loosens the parts

HERE *and* **HERE** *and* **HERE**

1 IMPROVED HIPOWER

2 DOUBLE HIPOWER

3 NATIONAL RIB WASHER

4 ANKOR HIPOWER

5 NATIONAL COLLAR GROOVED

6 THACKERAY SPRING WASHER

ONLY A SPRING WASHER CAN COMPENSATE FOR SUCH WEAR BY EXPANDING AND MAINTAINING BOLT TENSION UNTIL THE TRACK MAN COMES AGAIN, *only a spring washer!*

That is why Hipower Spring Washers more than pay for themselves in reduced upkeep costs—less labor and maintenance—fewer renewals and repairs.

Hipowers prolong the life of rail and of all joint parts.

Hipowers give an added safety factor to track.

Over 50 years of research and improvements—over 50 years of tests and trials—over 50 years of widespread use by leading railroads prove our spring washers to be one of the best railroad investments.

THE NATIONAL LOCK WASHER COMPANY, Newark, N. J.

Spring Washers • Retaining Rings • Drop Forgings • Car Window Equipment • Railway and Bus Windows

SAMSON SWITCH POINTS

for Safety and Economy

THIS

Ordinary knife-blade switch points usually look like this after but one year of busy points. They chip and break down. This condition means danger to equipment and lading in yards and cannot be tolerated on main line turnouts.

SAMSON

These Samson Switch Points have been at a busy spot for 3 years, and are good for many more years. This means labor and money savings and uninterrupted high speed traffic.

or

THIS

RAMAPO AJAX CORPORATION

CANADIAN RAMAPO IRON WORKS, LIMITED

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At every bite 3/4 of a yard of material

- It's a real bite this Cletrac and front end loader are taking—¾ of a yard.
- Up goes the shovel for loading in truck or car . . . and not a bit of material spilling off.
- A quick, easy means of transporting material is this outfit. Notice the clear vision, the lack of all overhead construction.

An off-the-track outfit that easily, quickly, economically loads loose bulk materials . . . transports them . . . cleans ditches—that's the Cletrac Tractor with front end loader. Equipped with 6½-foot bulldozer blade instead of bucket—easily done—it also handles light backfilling and levelling.

With its controlled differential steering—an exclusive Cletrac feature—this outfit literally turns on a dime . . . pulls on both tracks while turning . . . handles larger loads on the turns in drawbar work.

There's a Cletrac Crawler Tractor for every job from 22 to 94 horsepower, either gasoline, tractor fuel, or Diesel powered.

The Cleveland Tractor Company,
Cleveland, Ohio

Cletrac
Crawler Tractors

How to Cut Track Maintenance 50%

The picture shows a stretch of track a mile long which contains no rail joints. The rails are continuously welded. Because there are no rail joints, there are . . . except at the extreme ends of the long rails . . . no rail ends to batter and require building up and to shorten the life of the rail. Nor are there any of the usual plates and bolts to need frequent tightening. What's more, since the rails have almost uniform flexibility throughout their entire lengths, there is none of the customary constant disturbance of ballast, generally caused by added rigidity at the joints. Also, as there are no joints to pound, creepage and mis-alignment are minimized. In other words, this welded track requires no joint maintenance, needs lining and surfacing only at infrequent intervals, and, the rails will have far longer life.

No wonder authorities estimate that 50 per cent of present track maintenance can be saved by eliminating rail joints!

The one practical way to do away with rail joints at present is to Thermit weld. Long Thermit welded rails in this country, including jointless stretches up to seven thousand feet in length, are giving good accounts of themselves. In some cases these rails already have seen four years of main line service. In Australia and Europe, where the first Thermit welded rails were installed back in 1928, the same satisfactory results are reported.

It will pay you to investigate Thermit Rail Welding. Write for the complete story.

METAL & THERMIT CORPORATION, 120 BROADWAY, NEW YORK, N. Y.
ALBANY • CHICAGO • PITTSBURGH • SO. SAN FRANCISCO • TORONTO

THERMIT Rail WELDING

No. 101 of a series

Railway
Engineering and Maintenance

SIMMONS-BOARDMAN PUBLISHING CORPORATION

105 WEST ADAMS ST.
CHICAGO, ILL.

Subject: Questions and Answers Department

May 1, 1937

Dear Reader:

"I find the Questions and Answers Department one of the most helpful in Railway Engineering and Maintenance. As I receive my copy from month to month I turn to it first to see what I can find of direct application to my own problems. I am always impressed with the practical character of the replies and the number of different persons who reply. How do you arouse so much interest?" So spoke a well-known maintenance officer to one of our editors a few days ago. His comments have caused me to analyze our contributions to this column during 1936.

This analysis shows that 96 questions were discussed during the year and that to these questions we published 269 answers, or an average of 2.7 answers per question. It shows also that these questions came from 130 different contributors, indicating that each contributor sent us an average of 2 replies during the year. The maximum number of replies published from one contributor were 16. Furthermore, these replies came from men carrying 45 different titles, including chief engineer (8 different persons)—engineer maintenance of way (10 different persons), bridge engineer (11 different persons), division engineers, roadmasters, bridge and building supervisors, foremen and a few laborers. Also, where materials were involved, some of the most helpful and informative discussions came from manufacturers' representatives.

For the most part these replies were unsolicited, coming from men who were willing to contribute of their experience for the aid of fellow employees. It is our hope, however, that ultimately the department may be entirely self-sustaining in this respect. We are making progress steadily in this direction.

Reader interest and reader participation are essential to any magazine. The co-operation that you are extending so regularly indicates that we have both. We are delighted with your interest. We appreciate it. We solicit its continuance in an increasing degree.

Again we invite you to send us any questions that you would like to see discussed. Likewise, we urge you to send answers to those questions which your experience qualifies you to discuss, to the end that the Questions and Answers Department may be even more helpful and more representative of our entire body of readers in the future than it has been heretofore.

Yours sincerely,

Elmer T. Howson

ETH:EW Editor

MEMBERS: AUDIT BUREAU OF CIRCULATIONS AND ASSOCIATED BUSINESS PAPERS, INC.

ONLY ONE ADVANTAGE

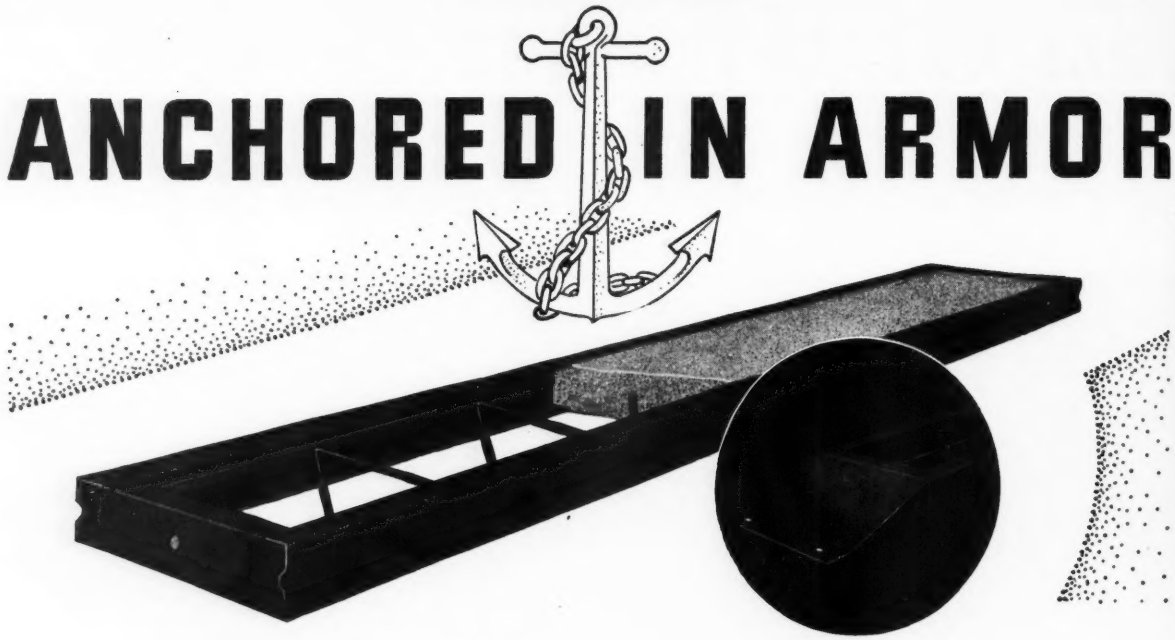
... but a big one

The single advantage of the Bethlehem Twin Frog Plate is this: with only three sizes of these plates in stock any frog can be fitted up, regardless of the weight of rail, or the angle or type of the frog. The economy of the great reduction in inventory is self-evident.

These plates are used in pairs, with each plate holding down one side of the frog. The base area is large; the forged hook which clamps the frog flange to the plate is stronger and has greater holding power than the track spike which would otherwise be used. Four spikes anchor each plate. The three standard lengths are 23, 27 and 31 inches.

BETHLEHEM STEEL COMPANY

ANCHORED IN ARMOR



● Concrete is *anchored into steel armor* in the construction of Truscon Weltrus Highway Crossings. The armor cannot loosen. Disintegration of concrete is prevented.

Made of rolled steel channels, Weltrus Crossing Sections have ribbed sides. Ends are completely closed with crown channels. Center reinforcing bar web, sides and ends are electrically welded into an integral unit.

Steel flanges overlap all corners, protecting the edges of the concrete. Sloping End Sections for bolting to the Weltrus Sections are available for protection to concrete and to prevent damage from dragging brake beams.

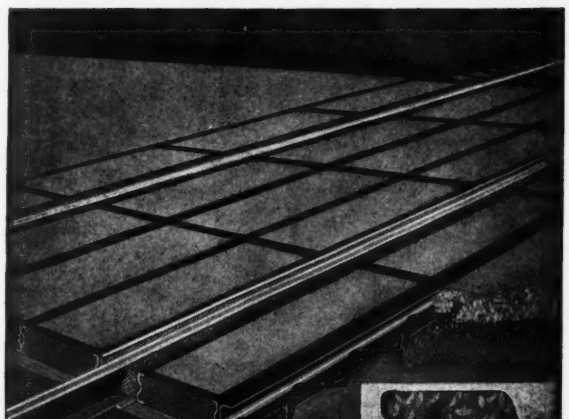
Dimensions of standard sections are 16¾"x 6 feet. Special sections can be furnished in any required width or length in heights of 4", 5", 6", 7" and 8". Standard width of planks between rails is 16¾". Where required, wider planks can be furnished for outer side of rails to fill space between rails and adjoining highway.

Installation of Weltrus Highway Crossings requires no special tools or sub-ties. Work can be done by regular section men. One or more sections can be removed when track work is necessary, thereby eliminating interference with highway traffic.

Write for free catalog which explains all details of Truscon Weltrus Highway Crossings, Intertracks Slabs, Header Sections and related equipment.

Truscon Weltrus Highway Crossing. Note center reinforcing bar web, sides and end channels (at left).
Detail showing Sloping End Section bolted to the Weltrus Section. Protects concrete. Prevents damage from dragging brake beams.

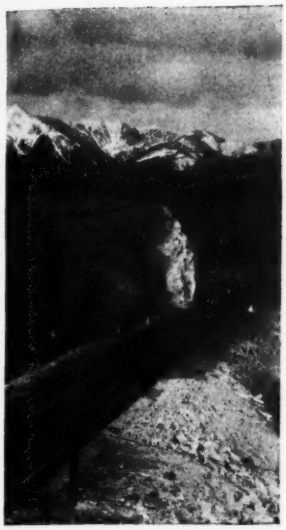
TRUSCON WELTRUS HIGHWAY CROSSINGS



Detail showing Truscon Weltrus highway header sections.

TRUSCON STEEL COMPANY

YOUNGSTOWN.... OHIO



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Railway Engineering and Maintenance

NAME REGISTERED U. S. PATENT OFFICE

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Railway Engineering and Maintenance

All for a Dime

What the Public Receives in Transportation

FOR LESS than a dime a day the average American receives all the varied railway transportation services that make our complex life possible. No other service of comparable importance in the daily life of an average individual is so cheap. None is more important to the convenience, comfort and well-being of the individual.

Last year the railways earned approximately $3,264,000,000 from the transportation of freight, $411,000,000 from passenger service and $328,000,000 for hauling mail and express and for all other services, a total of $4,003,000,000. Divided among our 127,500,000 people, this approximates $31.40 per person per year, or only 8.6 cents per day.

What He Receives

For this amount—only slightly more than half the cost of a package of cigarettes—this average individual receives a wide variety of services. It includes the delivery to his table of grapefruit from Florida or South Texas, of oranges from California, of strawberries from Louisiana or Georgia—of bread made of flour ground in Minneapolis from wheat raised in Kansas or Montana—of meat cut in Chicago or Kansas City from animals raised on the ranges of Wyoming—of coffee grown in Brazil and sweetened with Louisiana cane or Colorado beet sugar, etc.

In similar manner, the shoes we wear come to us from factories in New England or St. Louis, made from hides grown on the western plains. Likewise, the clothes we wear are made from wool grown on the western ranges and cotton raised on southern plantations. So it is with the materials entering into the furniture we use, the radio to which we listen and the automobile we drive, for it is the railways that bring together the raw materials of industry and distribute the finished products to consumers.

Second in importance only to food and clothing, in their contribution to human comfort, come heat and light. The wood lot has given way to the coal bin so universally that it requires only a slight interruption in the transportation of fuel to create widespread suffering, as numerous communities learned a year ago.

Considered from another angle, it is the railways that make possible the very existence of many communities such as the Imperial Valley of Southern California and the Rio Grande Valley of Texas whose products find markets only through the superior service developed by these carriers. Without these services the perishable products of these areas would fail of markets and those growing these fruits and vegetables would be forced to seek a livelihood elsewhere. So it is with other communities whose commodities find markets through channels afforded by rail service.

Service Being Improved

And this service is being improved steadily. In freight, faster and more dependable schedules have cut merchants' inventories in half. They have reduced the waste of perishable products and brought these products to the user in "garden fresh" condition. They have provided increasingly diversified services for diversified products. And they are now serving the shipper at his own door.

In passenger service, equally striking improvements are evident. Streamlined trains of new and novel designs, traveling at speeds not thought of only a few years ago, are appearing in increasing numbers in many parts of the country. Air-conditioned cars provide a relief from summer heat and dust not to be obtained in one's own home. Equipment of ultra-modern comfort, personalized stewardess attention, and other innovations are adding greatly to the pleasure of travel, while in safety the record of the railways is so far superior to that of any other transportation agency that hazard is no longer given any thought.

Maintenance Man's Share

The maintenance man has done his share in improving this service and no small part of the improvement has been made possible by the betterment of the roadway and structures. In 1922, only 40,000 miles of track were laid with rails weighing 100 lb. per yard or more; today the mileage of tracks so equipped exceeds 100,000. In 1936 alone, more than 1,000,000 tons of rails were rolled to sections weighing 100 lb. or more, sufficient to lay more than 5,000 miles of tracks. And the improvement has been equally marked in drainage, in ballast, in structures, in all those roadway facilities contributing to comfort and safety of travel.

Keeping pace with these improvements, the service rendered per unit transported, as represented by the average haul, has also increased. In 1921, for illustra-

tion, the average distance that each ton of freight was transported was 181 miles; last year it was 198 miles. Likewise, the average trip of the passenger has risen from 36.03 miles in 1921 to 45.7 in 1936. In this same period of widespread improvement in service the average charge to the shipper for hauling a ton of freight a mile has been reduced nearly 24 per cent and the average cost to the passenger per mile has been reduced 40 per cent.

This is the service which the railways are rendering —a larger, better service than ever before contemplated —and all for less than 10 cents a day. Where else can one buy so much in essential service, in public benefit, in individual comfort for a dime?

Lining Bars

Carelessness Makes Them Surprisingly Unsafe

THREE minor accidents which occurred recently in connection with the use of lining bars, emphasize the need for constant vigilance on the part of foremen to supervise every activity of the men under them, and the necessity for impressing upon them their obligation to use care to avoid injury to themselves or their companions. In the use of tools, as in other activities, the results of unsafe practices are seldom confined to the offender, but generally affect one or more of his fellow workmen.

These accidents do not result from deliberate action, but usually from thoughtlessness. In the first of those mentioned, a trackman, being in a hurry, dropped the bar he was using to attend to another matter. Another member of the gang stumbled over it, bruising his shins and skinning his hands. In the second case a lift was necessary in cramped quarters, and for convenience the man straddled the bar. He was fortunate that he received only a slight back strain instead of a rupture when the bar slipped. The third man was helping to turn a rail over and, having some difficulty in doing so, pushed the small end of the bar through a bolt hole. When the rail turned suddenly, his arm was bruised and his wrist strained. It was only good luck that prevented all of these accidents from being serious instead of minor, for the conditions were favorable for severe injuries in each case.

The first man did what four out of five men will do unless they are trained in safety; that is, he dropped the bar where he stood when he was through with it, instead of putting it where it would be out of the way of the other men in the gang. Likewise, the others did what, for them, was the most natural thing under the circumstances. Long experience, as well as the direct results of these particular actions, has shown that they did the unsafe thing in each instance.

While the lining bar is the simplest of all the tools used by trackmen, and while it is not inherently a dangerous tool, particularly since it has no cutting edge and in use is not swung as a maul or a pick, it has a surprisingly long list of injuries to its discredit. This fact should challenge both supervisors and foremen to be keenly alert for instances of careless use and misuse of this tool, remembering that both may include bent, dull-pointed or otherwise defective tools, as well as mishandling. To repeat a paraphrase of a well-known saying—in track work, eternal vigilance is the price of safety.

Fighting Floods

Why the Story Is Rarely Told

FLOOD disasters fall into two distinct classifications; (1) the sudden and highly destructive stream run-off caused by a "cloudburst" or the failure of a dam, and (2) the protracted high water that follows extraordinary rainfall over large areas. Violent run-offs of short duration give little warning, the damage is done in a few hours' time, and where railway property is involved the job of the maintenance forces is that of repairing or replacing the tracks and bridges that have been damaged or destroyed, with whatever means are available and in the shortest possible time. It is a matter of recovering the ground lost after a surprise attack.

Not so with the general flood, for in this case there is usually ample time for the railway to marshal its resources before the enemy makes its attack. As a result, the forces are usually prepared to put up a valiant fight against the encroaching waters, and if the rise is not too great it may be possible to continue operations under difficulties. Yet, it is often necessary to concede defeat and withdraw forces and equipment until the receding waters afford an opportunity for more favorable counter attack.

However, in a major flood, like the one that confronted the railroads in the Ohio valley in January and February, the battle extends over such a wide front that the direction of the fight becomes extremely difficult. Chief among the obstacles imposed is the failure of the normal means of communication and transport. The division and sub-division forces are, of course, entirely competent to carry on their work without direction from headquarters, but they often lack the necessary materials because of interrupted train service. Furthermore, in a flood extending over such a wide area as to involve many different lines of a railway system it may be found expedient to abandon the protection of some lines in order that efforts may be concentrated on more important through routes.

With wires down, highways closed and various rail routes cut off, the job of directing the work in a way that will insure the maximum continuity of train movement in the face of the trying conditions imposed is one that tests the capabilities of railway officers throughout seemingly unending days and sleepless nights. And in view of the fragmentary nature of the information at their disposal and the fact that the conditions change almost from hour to hour, it is not surprising that the full story of the flood and what was done about it is rarely made a matter of record.

It is for this reason that we take pleasure in publishing on page 338 of this issue an account of the experiences of the forces of the Northern district of the Illinois Central in the Ohio River valley, during January and February. Mr. O'Rourke, not only presents a picture

of the scope of the high water troubles, but he shows also how the aspect changed from day to day and how the plan of the campaign was revised according to the dictates of the altered conditions. His story comprises a valuable record of the work of these forces, but, more than this, it serves as a word picture of the trying conditions that confronted the railways throughout the Ohio River valley and of the means they employed in overcoming the obstacles presented.

Shabby

Many Buildings Need Attention

"BUT WE are still far behind in our building maintenance, especially in painting." It is in substantially these words that most maintenance of way officers conclude an answer to a question concerning the present status of the properties under their charge. They generally assert that nearly all ground lost in the upkeep of tracks has been recovered and that bridges are thoroughly safe, although some are in need of paint and others ought to be replaced rather than to undergo still further repairs. But in nearly every case the comment indicates that buildings have long occupied the status of the stepchild.

Why this is so need not be discussed here at any length. Because increasing deterioration of a building does not ordinarily result in any hazard to train operation, appropriations for maintenance have been concentrated on the tracks and bridges, where failure to maintain at least a reasonable degree of upkeep would most certainly impose added hazards. Furthermore, failure of paint coats on bridges results in more tangible and immediate evidence of the deterioration of the material exposed to the elements than is the case with inadequately-protected wood surfaces.

The fact that buildings have been neglected is no reflection on the maintenance of way organizations. It is only by avoiding expenditures on items of upkeep that were not absolutely imperative that they were able to achieve the outstanding distinction of providing safe tracks and structures for higher speed trains during a period of greatly curtailed appropriations.

Realizing that the maintenance of buildings cannot be postponed indefinitely, maintenance officers are urging increased appropriations for work on these structurs. However, there is need for a marked expansion in the expenditures not only to insure that the deterioration of buildings will be abated, but also to overcome the unfavorable impression created by the shabby appearance that many of them present, particularly passenger stations.

It may be argued that many of the station buildings now suffering from neglect are no longer needed or are of a size greatly in excess of actual needs. The answer to this situation has been found on some roads to be the removal of the buildings entirely or then reconstruction to smaller size. No physical harm may come from the neglect of a station that is no longer of service, but it surely constitutes a poor advertisement for the railroads.

Turntables

Why They Should Be Carefully Maintained

AN ENGINE terminal may well be compared with the plant of a daily newspaper, since its output—locomotives serviced ready for use—must be timed to a schedule just as exacting as that set up for the various editions of a paper. Likewise, it must be prepared to turn out "extras" whenever occasion demands. The enginehouse is the primary element in the engine terminal, and in America this has almost invariably taken the form of the "roundhouse," because the roundhouse, with its turntable, is more economical in the use of space than any other arrangement that permits access to any stall without interfering with the occupancy of any other stall.

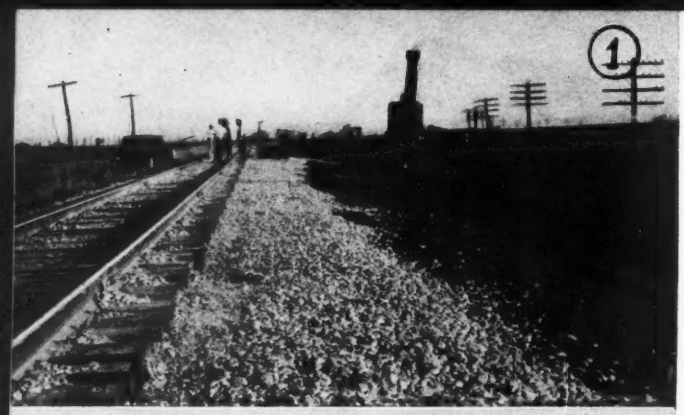
But, while the turntable is thus an essential element in an unusually convenient arrangement, it is also an exceedingly vulnerable feature of the layout, for if it becomes inoperative for any reason, all locomotives that happen to be in the house at the time are just as inaccessible as if they were a thousand miles away.

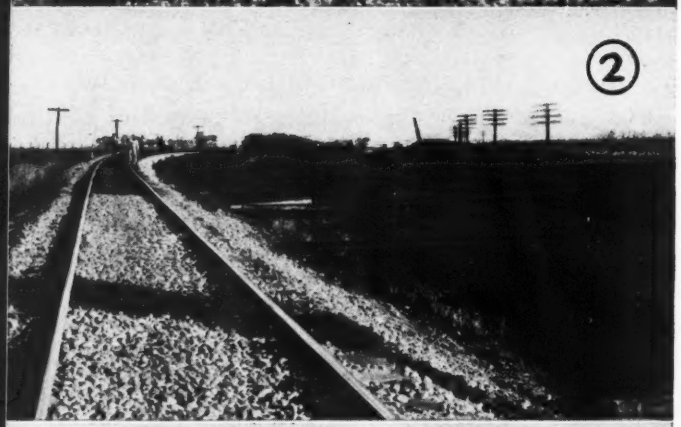
That this fact is generally recognized, goes without saying, but it is surprising how grievously turntables suffer from abuse and neglect. This is by no means as true today as it was years ago, when turntables were shorter and lighter and it was possible to turn them manually in the event of power failure, even in cases where a deteriorated condition of center bearings had resulted in greatly increased turning resistance. Today, owing to the increase in the weight and length of locomotives, the turntable is in effect a movable bridge of considerable magnitude that must be equipped with bearings and turning machinery capable of handling enormous loads. It is too valuable a piece of equipment to suffer neglect, entirely aside from the disastrous consequences of a failure.

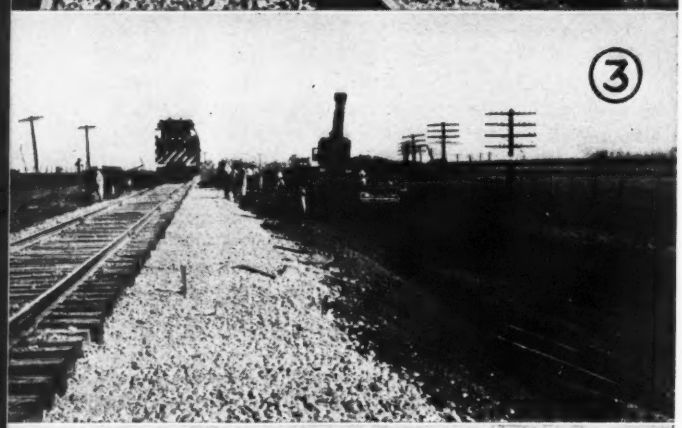
Railway managements are manifesting an increasing appreciation of this fact, with the result that turntables are receiving better care than was formerly the case. As an illustration of the attention given to turntables, the reader is referred to the article on page 344 which not only outlines the practices of the Burlington in the inspection and care of its turntables, but also presents an interesting review of the development and evolution of this important railway facility over a period of more than half a century.

WORLD'S LONGEST RAILS.—A hundred tons of steel rails, each 120 ft. in length and rolled by the Skinningrove Iron Co., were laid recently on the main line of the London & North Eastern (England). These are believed to be the longest rails ever rolled in one piece in any part of the world. The longest rails hitherto manufactured were 90 ft. in length and were used in special circumstances, but the standard length of rail in England is 60 ft.

The 120-ft. rails were laid on a stretch of track at Holme, near Peterborough, England, where expresses attain a speed of 90 miles per hour. By the use of longer rail units it is hoped that smoother running will be secured by reducing the number of joints and by simplifying the work of maintaining the track.







1. Skeletonizing of Track and Spreading of Ballast at West End of Curve Completed. 2. All material Was Distributed and Arranged in Advance. 3. The Last Train Passed Over the Curve at 7:35 A.M. 4. Power Jacks Raised the Track to Permit Insertion of the Skid Rails. 5. Shifting of the Track Was Started at 8:00.

Santa Fe Perfects C

THE program of curve reduction that has been in progress on the Atchison, Topeka & Santa Fe during the last two years has required the throwing in of so many curves that the maintenance forces have evolved practices in the conduct of this work that enable them to carry it out with a maximum of speed and economy and a minimum of interruption to train service. While much of this work has been done on the route of the Santa Fe's Super Chief between Chicago and Los Angeles, curves on other portions of the system have also been reduced where the old alinement was such as to impose undesirable speed restrictions.

Throws Up to 100 Ft.

In some instances this work has involved the lining of the curves over as much as 100 ft. at the center and in practically all cases the work has been done without interference to train schedules. As a typical illustration of the speed with which long curves are thrown in, a curve near Gonzales, N.M., 1,900 ft. long, was lined over a maximum distance of 32 ft. in 1 hr. 20 min., by a gang of 70 men with the aid of crawler-mounted cranes. The time given covers the period between the cutting of the track and its return to service, with the ties picked up sufficiently to permit train movement under a slow order.

In-as-much as this work has been in progress simultaneously on a number of divisions, some variations in practice and in the equipment used is to be expected, but the general procedure under similar conditions is the same, as a definite effort has been made to acquaint each division with improvements in technic as they have been developed. In individual cases, of course, approved practices must be altered in detail to adapt them to local conditions. Preliminary preparations at the curve comprise

Curve-Throwing Technic

Methods now employed on this road in throwing curves over to reduce them are the result of experience gained in carrying out an extensive curve reduction program during the last two years. This article contains a general discussion of the practices followed and a detailed account of the lining of a curve where the maximum throw was 70 ft.

an important phase of the work and include the grading of the new roadbed, which is done under contract, the unloading and distribution of the necessary materials and equipment, and the instruction of the foremen and assistant foremen as to the part which each is to play in the conduct of the work.

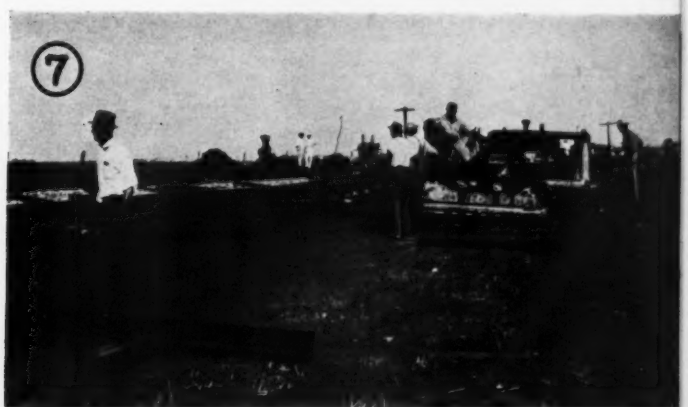
An expedient which has been widely used by the Santa Fe in its curve-throwing operations involves the use of greased skid rails on which the track is supported during the relining process. These rails are inserted under the track at each joint on the inside line of rails and are blocked up as necessary to prevent the track from dragging on the ground. Their use has proved particularly advantageous where a considerable throw is involved or where there are surface irregularities in the area to be traversed.

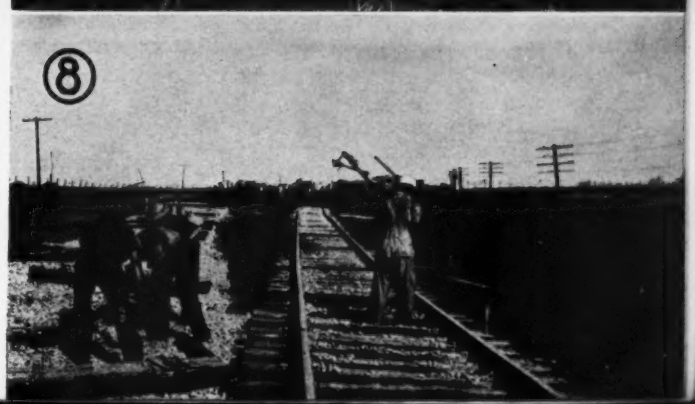
Except near the ends of curves where the throw is 9 ft. or less the track is thrown without skeletonizing it, the ballast being transferred to the new alinement by means of clamshell buckets after the track is thrown. Where skid rails are to be used in the shifting process the track is raised by means of power track jacks to permit the insertion of the skid rails. Also, where skid rails are not used, it is necessary in some instances to raise the track by means of a jack and drop it in order to loosen the ties from tightly compacted ballast.

Crawler Machines Essential

While a considerable number of the curves have been thrown by men with lining bars, especially where the throw was limited, experience has definitely demonstrated the advantages of mobile power units for shifting the track. On single track lines crawler-mounted units—tractors and power cranes and excavators—are almost essential, but on double-track lines rail-mounted equipment can be used for shifting the outer track after the inside track has been thrown. To do this, a power ditcher mounted on a flat car is placed on the previously-lined inside track, with the line from the hoist drum extending through a snatch block attached to the side of the car and thence to a hitch on the near rail of the outer track.

As a rule the lining of the curve is begun simultaneously at the ends and carried toward the middle. Up to the point where the throw reaches about 9 ft. the track is skeletonized and lined by hand. The remainder of the curve is thrown by power machines, one or two of which are employed at each end. These units take positions on the inside of the curve, the pulling line of each machine being





6. Close-up of Power Jack in Operation. 7. All the Track Was Off the Old Roadbed by 8:18. 8. Spotting the Track at Run-Off From Old Ballast to the New Roadbed.

9. The Skid Rails Were Pulled Forward to New Positions at 8:40. 10. Shifting Forces Meeting at the Middle of the Curve at 9:20. 11. Both Sections of Track on New Roadbed at 9:40. 12. Spacing Ties, Regaging and Spiking at 9:50.

attached to the inside rail by means of a chain. To guard against bending the rails where the hitches are taken, they are reinforced in each case by means of a crosstie which is laid against the inside of the rail and the chain looped around both the rail and the tie.

Hitches at 12-Ft. Intervals

Where skid rails are not used, or in other words, when the track is dragged along the ground, hitches are taken on the track by the pulling units at intervals of about 12 ft. As excessive distortion of the track occurs if throws of more than about six feet are attempted, it is necessary for the cranes to pull over the track in stages of six feet or less, going back towards the end of the curve each time and starting over. Where skid rails are used in shifting the track it is not necessary to limit the throw to six feet at a time since a greater length of the track can be moved from one hitch of the machine without kinking.

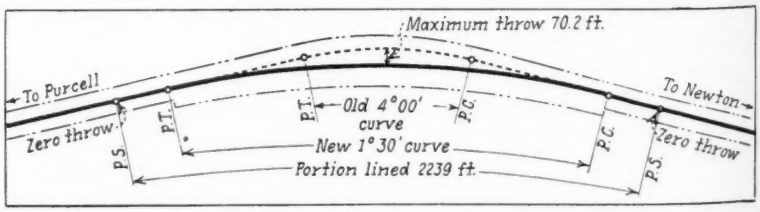
A necessary step in the lining of curves is the removal of a panel of track from the center of the curve so that the curve can adjust itself to the shortening process that takes place as it is lined. In any event, the track has to be cut before it can be lined and by removing the panel at the middle the possibility of interference between the two portions of the curve is avoided.

After the shift has been completed, enough ties are set in to support the closing rails, measurements are taken and the closing rails are cut to length and inserted. While this work is in progress the cranes, equipped with clamshell buckets, begin the transfer of ballast from the old roadbed to the new. In some instances a special sub-ballast is used on the new alinement and the transfer of the old ballast is deferred pending proper settlement of the new roadbed.

An Example

Illustrative in detail of some of the practices followed on the Santa Fe is the following description of the relining of a curve near Mulvane, Kan. This particular curve was reduced as part of a program of curve reduction which was undertaken during the summer of 1936 on the main line between Newton, Kan., and Purcell, Okla. As shown on the accompanying drawing, the particular curve under consideration was reduced from 4 deg. to 1 deg. 30 min., and the length, including the spirals, increased from 927 ft. to 2,239 ft., the latter length comprising the amount of track, including 1,312 ft. of tangent, that had to be lined over. The maximum throw was 70.2 ft.

Preparatory to the lining operations, the new roadbed was graded, which involved the excavation of a light cut having a maximum depth of 4 ft., and an old waste bank between the old and new alinements was bladed down. The excavation of the roadbed was done with a dragline and all waste material was cast into banks so located that they would not interfere with the lining operations.



Sketch of the Curve Showing the Old and New Layouts

The longest time available for lining this curve without interference to traffic was between regularly scheduled trains that passed over the curve at 7:35 a.m. and at 11:00 a.m., a period of 3 hr. 25 min. In order that the curve could be lined over and placed in condition for carrying traffic during this period it was necessary to make complete advance preparation, to the end that the actual lining of the track could be started immediately following the passing of the train at 7:35, and carried on thereafter without interruption or delay.

Preparations

These preparations, which were carried out on the day before the curve was lined, included the distribution by work train of the materials to be used, such as skid rails, blocking, renewal ties and fence posts. The skid rails were arranged on the inside of the curve, one opposite each joint in the nearest line of track rails, in such position that they could be readily slipped under the track. To allow for creepage during the lining of the curve these rails were placed slightly out of normal with the track. Sufficient of the blocking, which consisted of pieces of old ties, was unloaded at each skid rail to permit it to be raised about 7 in. off the ground on supports about 20 ft. apart, this being necessary to prevent the track from dragging on the ground. The fence posts were used as rollers under the track during the lining operations, especially near the ends of the curve where skid rails were not used and on the body of the curve during the transfer of the track from the skid rails to the new sub-grade.

On the same day that the foregoing preparations were made, that portion of the track that was to be lined over 9 ft. or less, amounting to 430 ft. at each end of the curve, was skeletonized. This was done to facilitate the lining of these portions of the curve, which was accomplished by hand in the usual manner. The remainder of the curve was not skeletonized.

Jacking Up the Track

On the day on which the curve was lined, immediately following the passage of the 7:35 train, a 20-man gang with lining bars started in at each end of the curve to line the skeletonized portion. At the same time two men using claw bars pulled the spikes from the joint ties on that portion of the curve that was not skeletonized. Next, two power jacks, one starting at each end of the unskeletonized portion and proceeding toward the middle of the curve, raised the track at each joint sufficiently to allow a tie to be inserted under the rails and on top of the joint ties, this being done by two men. Following behind but keeping pace with each jack, a 10-man gang, using rail tongs, inserted a skid rail under the track rails at each joint in the inside line of rails. To reduce friction between the track rails and the skid rails the running surfaces of the latter were oiled.

Since the lining of the unskeletonized portion of the curve was started before the power jacks had finished raising the track, thus making it impracticable for them to return over the track they had raised, their disposal presented something of a problem. This was solved by allowing the jacks to remain in position during the lining operations on the two middle rails of the curve, which were disconnected from the remainder of the track and not lined over. Thus advantage was taken of the fact that, due to the shortening of the curve because of the reduced curvature, a rail in each line of rails had to be removed and replaced with a shorter closure rail in the new alinement.

As soon as sufficient of the skid rails had been inserted under the track

(Continued on page 349)

13. The Closure Rails Were Cut at 10:01. 14. Ready for the Screenings. 15. Applying Screenings at 11:10. 16. Work Train Reached End of Curve With Screenings at 11:25 A. M.

They Directed the Battle Against High Water. Left to Right: J. W. Hevron, General Superintendent; Mr. O'Rourke; C. J. Harrington, Division Engineer; M. M. Backus, Assistant Engineer Maintenance of Way; and F. L. Thompson, Vice-President

"Through Hell a

How maintenance forces of the Illinois Central fought floods and slides on a dozen fronts along the Ohio river and its tributaries

OUR water troubles began with such minor difficulties as to afford no indication of what was to follow. Early in January local rains resulted in minor washouts between Simpson, Ill., and Grantsburg on the line from Carbondale, Ill., to Reevesville. A break in the levee along Big Bay creek north of Reevesville also caused washouts at the wye to the Golconda line. Repairs were made without any serious delay to traffic or extraordinary expense.

About the same time Druary creek rose suddenly along the main line near Makanda, Ill., reaching an unprecedented height and submerging more track to a greater depth than at any time before. No damage was done, however, because of heavy riprap protection placed over a period of years following previous overflows. Trains were delayed a few hours but traffic was resumed as soon as the water receded.

Heavy rains were occurring generally in the Ohio River valley, and when we read of conditions far up the river we realized that we would probably have some high water, but could not believe that the stage at Cairo, Ill., would be more than three feet higher than that reached in 1927. The Mississippi was low and we felt that it would provide sufficient outlet for any flood coming down the Ohio.

On January 20 we went to Grayville, Ill., because high water in the Wabash river was getting dangerously close to our track and it was necessary to protect against wave wash and erosion at bridge ends. From there we went to Evansville, Ind., because part of our McClains branch between Evansville and the Ohio river was under water, but at that time this was backwater and was doing little damage. Later the river entered an old channel and came through with such force that some two miles of that branch line track was washed off the roadbed and turned over.

No Itinerary on This Trip

Leaving Evansville in a hard rain storm that had been falling all day, we started for Indianapolis where the White river was on a rampage. Enroute we received word that a slide had occurred in a cut on the Edgewood line between Edgewood, Ill., and Bluford, so we drove across country that night in a blinding rain to get excavating machines at work clearing the line.

By this time the Ohio was rising fast and was over our main line between East Cairo, Ky., and Wickliffe, so that it was important that our alternate route over the Edgewood line and the Bluford district to Fulton, Ky., be kept open. Going down over that line we arrived at Reevesville on the evening of January 21 and found water again over the track between Grantsburg and Simpson, and washing badly, for the second time that month. However, after studying the situation we realized that nothing could be done economically until the water went down.

Continuing to Carbondale with the thought of making a trip over the main line to the south end of the Bluford district, via Cairo, the fol-

Water over the Tracks at the Cache River Bridge near Ullin, Ill.

*Abstracted from a paper read before the Maintenance of Way Club of Chicago on April 5.

ell and High Water"

By GEORGE M. O'ROURKE,
District Engineer, Illinois Central

This is a day-to-day account of the slides, washouts and high water troubles that disrupted operation on the Illinois Central as the result of the floods in the Ohio river and its tributaries late in January and in February. It presents also a lucid account of the manner in which man power, materials and equipment were marshalled to meet each new emergency as it occurred. This story of tireless effort, resourcefulness and fortitude comprises an epic in railroading that had its counterpart in the experiences of other lines throughout the area that came under the paralyzing influence of this great disaster.

lowing morning, we found that the water had come up so fast and the current was so swift between East Cairo and Wickliffe that all traffic was stopped.

The Bluford district, crossing the Ohio at Metropolis, comprises our alternate route between the north and the south. All of our trains could have moved that way, getting back to their regular route at Fulton, Ky., but during the night a slide occurred in Baltimore cut, a few miles north of Fulton on the Bluford district, catching a passing train, turning over the locomotive and a car and derailing several more cars. At about the same time a slide was reported in the high fill across the Ohio River bottoms on the main line north of Wickliffe.

Efforts to Remove Slide

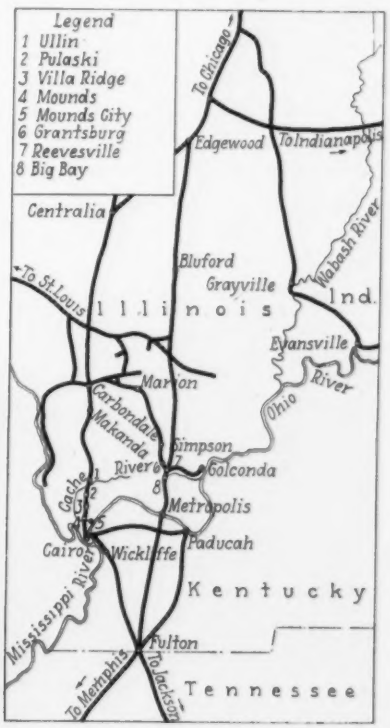
Excavating machinery was put to work immediately to remove the slide in Baltimore cut so that a track could be laid around the locomotive to get traffic moving. At the same time a bridge gang with a pile driver and bridge material was started through the water from East Cairo to Wickliffe to assist in restoring the track at the slide. However, the current was so swift that men could not keep their footing while removing drift from the track, and the rising water was carrying drift under the train. To avoid a derailment and probable loss of the pile driver, the attempt to get through was therefore abandoned. Later this track was washed off the dump and turned over.

One Slide After Another

For a time, the slide in the Baltimore cut continued to come in as fast as the excavating machines could remove it. Eventually, after some progress was made at this slide, another one occurred and we were as bad off as when we started. Something else had to be done, so a track was laid over the top of the slide on a heavy bed of cinders. All this took time, although we had forces working continuously day and night. In the meantime, our trains, detouring over other railroads not yet affected by the flood, were being seriously delayed.

On January 23 the water was within a foot of the all-time high at Cairo and the openings in the sea wall were being closed with timbers and earth. Tracks leading to river inclines and grain elevators were taken up where they passed through the openings in the levees and all river-rail traffic was discontinued.

Below—A Work Train With Repair Materials Moving Into Flooded Territory North of Reevesville. Right—Map of the Illinois Central Lines in the Flood Territory



"Surface Current Carried Another Quarter Mile of Track Off the Fill North of Wickliffe, Ky.," (Left), Requiring the Laying of a New Track (Right)

Refugees, coming in from the low lands, were housed in boxcars placed on tracks above the flood waters at East Cairo, North Cairo, Ill., Mounds and other points.

Hundreds of carloads of repair materials, sacked dirt, empty bags to be filled with dirt or sand, loose dirt for filling bulkheads, slag and rock ballast, cinders, riprap, bridge material, rail and track fastenings were moving into the flood territory from other divisions. Groups of track laborers and bridge men in camp car outfits were moved in, and protection work was started at places where previous floods had given trouble. But heavy rains continued to fall and we realized that we were in for a real battle.

Ohio Takes a Detour

On January 24 water was coming up Big Bay creek from the Ohio river and attacking the Bluford district between Reevesville and Big Bay. This was a matter of grave concern, because the railroad at this point occupies a low divide that separates the headwaters of Big Bay creek and the Cache river. The valleys of these two streams extend in an east and west direction across the southern extremity of Illinois, and it has been rather definitely established that they comprise the trace of an ancient channel of the Ohio river that once joined the Mississippi river several miles north of the present confluence at Cairo. As the Ohio river continued to rise, a considerable volume of water from the river, following the general course of the old channel, resulted in serious water troubles that are described in following paragraphs.

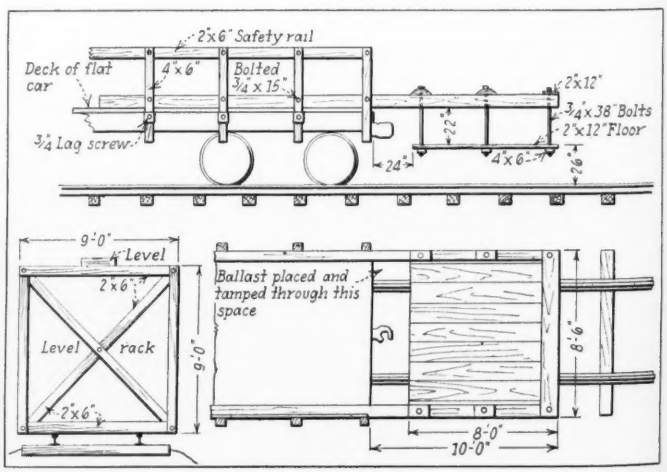
In the meantime, on January 25, the water on the gage at Cairo stood at 58.62, only 1.38 ft. below the top of the sea wall. All women and children were ordered out of the city, the Illinois Central providing transportation to refugee camps in towns up-state. In addition, we furnished carloads of sacked and bulk dirt as fast as it was asked for by the forces that were constructing a bulkhead on top of the seawall.

On the following day water entered Mounds, the first town north of Cairo. Highway route 147 northward from Mound City, on the Ohio river, settled at Cemetery creek north of Mound City, and although an army of men placed sandbags, trucked there by CCC boys from cars on our tracks at Mounds, they lost the fight and Mounds was flooded, together with our yard at that point.

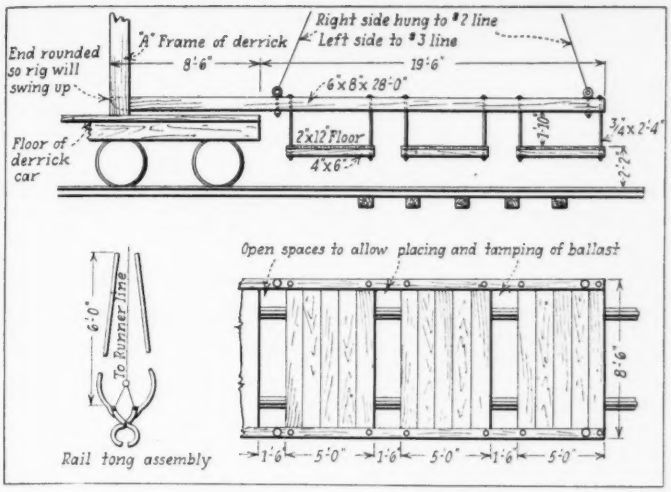
Anticipating this, we had heavily sandbagged our main track southward from Mounds to the Cache River levee but the water came with such force that several deep washouts were made in our embankment and the depth of water precluded any effort towards economical restoration. At the same time our branch to Mound City was submerged to a depth of eight feet in places and on the following day the levees back of that old river town broke and it was flooded. At crest stage, water was over the eaves of the Illinois Central station, while the Big Four depot could be identified only by the train order signal. This stood at "clear," but no trains passed that way.

Still More Troubles

In the interim the back water from the Ohio river continued to rise rapidly over the track on the Bluford district, entering the Cache River valley and reaching our main line at Ullin. On January 28 it commenced flowing over the track south of the station, where this had never happened before. On receipt of information that our tracks in this vicinity might be inundated, we sent a work train loaded with sacked dirt and men to protect them. We were holding our own until the levee



Left—Some of These Men Are Standing on the Under-Water Surfacing Platform Cantilevered from a Flat Car. Right—Plan and Elevation of This Platform and Drawing of the Level Rack that Was Used with the Platform Illustrated at Top of Next Page



Upper Left—Plan and Elevation of the Surfacing Platform that was used with the Derrick Car, and Sketch of Rail Tongs. Right—View of This Platform Showing Also the Level Rack

at Carnak broke, following which such a volume of water came down upon us that sacks of sand dropped from cars were carried on the surface of the water for some distance before disappearing.

Realizing that it was futile to continue our efforts to save both main tracks we moved our work trains to the northward main track and covered the southward main and the space between with sacked dirt. More than 25,000 sacks of dirt and sand were placed along this ¾ mile of track between Thursday morning and Friday night, when the water became so deep over the rail that it entered the fire boxes of our locomotives. If a wash had started on the 15-ft. fill across this bottom we would have had to build some bridges to restore the railroad. As it was, when the water receded there were some holes under our southward main but the northward main was intact. We resumed freight operation on it in 40 in. of water to serve the isolated towns of Pulaski, Villa Ridge and Mounds, which were then on an island.

Sandbags Win

On January 30 the flood commenced encroaching upon our main tracks for a distance of a mile at a point about halfway between Ullin and Pulaski, and after another 18 hours' battle of sandbags against the river, the sandbags won and both main tracks were found to be in serviceable condition when the water went down.

These experiences took place during nine days and nights, and our men were worn out. So, realizing that nothing could be done between Ullin and Wickliffe because the embankment was washed away near Mounds and three quarters of a mile of track washed off the roadbed and turned over north of Wickliffe, it was decided that it would not be practicable to restore the main line to service through Cairo until the water receded.

Shifting the Offensive

For this reason we turned our attention to the alternate Edgewood cut-off-Bluford district route over which traffic was then interrupted by four feet of swiftly-flowing ice water at Reevesville. If we could restore traffic across this three miles of flooded area, we would be able to move freight trains through it just as soon as the water was below car-floor level, because the rest of this line was above water and the trouble in Baltimore cut had been overcome. This would enable us to move our Chicago-New Orleans and Florida business via Fulton and Jackson, Tenn., since one main line between Fulton and Memphis, Tenn., was then out of service because of high water in the Mississippi river.

To restore track to serviceable condition under four feet of swiftly-flowing water was no easy task and called for the development of an ingenious method involving the use of special equipment. The first step was to build a platform, suspended from two bridge timbers and extending out from the end of a flatcar, cantilever fashion. Men in waders stood on the platform, which was fenced in to keep them from being washed off. Other men carried sacks of slag across the empty flatcar and handed them down to the men on the platform. The slag was heavy enough to remain in place when pushed between the ties with poles until enough was deposited to permit tamping the ties. The train was then moved ahead a few feet and the next hole filled.

This scheme proved satisfactory until a place was found where the embankment was washed away and

Mounds, Ill., Was in the Heart of the Flood Territory

the track sagged into the washout. Then something else had to be done. To solve this problem, a longer platform, permitting more men to work in the water, was swung from the boom of a pile driver-derrick. Long handles were welded onto ordinary rail tongs so that men on the platform could hook them onto the ball of the rail while a strain was taken on them with the derrick line. The track was then pulled out of the hole and held at the desired elevation until sacks of slag were deposited under the ties.

To determine how high to raise this track, a square, made of four boards, was first lowered onto the rails at the edge of the washout and marked at the surface of the water. This square was then placed on the rails as they were lifted out of the hole to show when to stop lifting and to indicate when the rails were level, one with the other. This procedure which was repeated, foot by foot, for a distance of approximately three miles was developed by C. J. Harrington, division engineer, and his supervisors.

New Track on Restored Roadbed North of Wickliffe, Ky.

Plenty of Ice Water

The water was about level with the floor of the flatcar and the men on the platform were in water waist deep. Pieces of ice were floating about them and they could work only a short time without warming, so a stove was set up on the flatcar and a hot fire kept going for that purpose.

Following immediately behind the derrick train was a train of flat-cars loaded with one-man size riprap which was placed along the track to keep the sacks of slag from being washed away. This train was followed by another slag train, with a flatcar like the one first described, that was employed in plugging any weak places that were encountered.

This process was carried on continuously with three eight-hour shifts per train while the crest of the flood came and passed. By the time the water fell sufficiently so that boxcars could be run through it without getting water in the cars, the track was restored in surprisingly good condition. On February 7 the first train, a northbound freight train of 40 cars, crept slowly through three feet of water, and the detouring over hundreds of miles of other lines came to an end.

More Good News

On January 27 the first ray of hope for our railroad reached us. The Wabash river was falling at Grayville. On January 29 we heard that the worst was over at Evansville, where our shops, freight station and all tracks in the city were flooded. Water 50 in. deep over the top of our rails at Pigeon creek on the edge of town prevented any movement of freight cars in and out, but we continued to run stove-heated passenger cars through this Ohio River back water, bringing in help and taking out refugees.

On January 30 the Ohio was falling at Louisville, Ky., and the crest of the flood was reported between Owensboro and Evansville. The crest of the flood was approaching Cairo, but the residents felt secure behind the concrete sea wall with a three foot bulkhead on top of it. The crest at 59.62 ft. on the gage finally reached there on February 4, with waves washing over the top of the wall and against the wooden bulkhead.

On February 3 we resumed freight service into Evansville through 40 in. of water. On the next day the water appeared to be at a standstill at Cairo, Mounds and Ullin. From that time on it was falling, and on February 8 we got through 44 in. of water with an engine and flatcar at Ullin, finding the northward main intact, as we hoped it would be. On the next day we resumed local freight service to Pulaski, Villa Ridge and Mounds.

Still Tough

The surface current of falling water appears to be about as swift as it is on the rise. When the water between Reevesville and Big Bay fell to where we felt we could run air-conditioned trains through it we experienced a keen disappointment. The swift current carried away the ballast from the decks of three ballast deck trestles during the morning hours of February 9, blocking the railroad again, and during the next 48 hours there was no rest for anyone until service was restored. Long driftbolts were driven into the guard rails about a foot apart to keep the bags of slag from being washed away, and finally enough were tamped under the ties to permit the passage of trains. During the next 40 hours, 76 freight trains and 10 passenger trains passed Reevesville.

On February 10 surface current turned over and carried another quarter mile of track off the fill north of Wickliffe, Ky. Working in shallow, swift water, the northward main track was restored at Mounds and service into Cairo was resumed on February 12. Two days later trainloads of refugees were brought back home from West Frankfort, Marion, Pinckneyville, Herrin, Wolfe Lake, Anna, Carbondale and DuQuoin.

As soon as we had a track into Cairo we moved men across the Ohio to Kentucky to help the southern lines forces lay a track to replace the one turned over and washed off the embankment near Wickliffe. It was completed for the movement of our train No. 2 from New Orleans on February 15. On the next day we had double track in service and the flood was history.

The Pocahontas of the Norfolk & Western

Pave Stock Yard With Grouted Concrete

Pouring the Grout into the Gravel

A FIVE-INCH pavement made by grouting a blanket of pit-run gravel provided the means of effecting a marked improvement in the stock pens of the Chicago, Burlington & Quincy at Quincy, Ill. This pavement covers an area of 845 sq. yd. of open pens and was completed at a total cost of about $1,100, compared with an estimated cost of around $2,500 for a pavement of equal area and depth constructed in the conventional manner.

The area paved comprises that part of the stock pens at Quincy that is used for the feeding, watering and resting of stock in transit, the balance of the pens being leased to shippers. Owing to lack of adequate drainage, the black loam on which the pens were built becomes very soft when wet, and when stirred up by animals was reduced to the consistency of a thick soup to a depth of as much as a foot. As a result there were frequent complaints from the shippers during the wet seasons.

Circumstances attending the use of these stock pens were such that only a limited expenditure could be justified and various expedients were suggested for correcting the condition at a minimum outlay, but none promised a satisfactory solution until the idea of a portland cement grout pavement was proposed. The use of cement grout was not entirely new on the Burlington, as it had been used previously as a filler for the joints of stockyard pavements constructed of brick bats. These were obtained from the yards of paving brick manufacturers at no expense other than the cost of handling and transportation, and when placed on a sand base and grouted produced a good pavement for stock pens. However, after a comparison of the estimated costs and relative merits of the two types of pavement, it was decided to use the grouted macadam.

Area Excavated

An important element in the cost of the pavement, which would have been involved no matter what type had been constructed, was the excavation of the entire area to a depth of five inches. This was necessary to obtain the desired top elevation for the pavement and to remove the mixture of mud and manure that would have afforded an unsatisfactory base for any pavement. In making the excavation, a limited amount of riprap, that had been dumped into the yards at some previous time, was encountered and all stones that were not more than five inches in their greatest dimension were scraped off and left in place.

After the site had been cleared, a six-inch layer of gravel was spread over it and thoroughly tamped, producing a finished thickness of about five inches. The top surface was sloped slightly to provide drainage. All riprap stones that had been left in place were rammed down so that their tops were below the surface of the finished pavement.

The Grout

Next a mixer was set up at one corner of the yard, planks were laid down to form runways for the wheelbarrows and the mixing and placing of the grout was started. The grout was mixed in the proportions of one part of cement to two parts of sand, with eight gallons of water per sack of cement. In general, the procedure was to pour the grout on the gravel and continue the process as long as the gravel would absorb it, or until the grout could be flushed over the surface.

The gravel as specified for this job was to contain no particles smaller than ¼ in., since the aggregate would then be sufficiently porous to take the grout readily. Unfortunately, however, the material delivered contained a considerable amount of finer particles, but by forking the gravel, it was possible to get a thorough penetration.

A home-made two-man float provided an effective means of obtaining a uniform surface, and as soon as the grout had set the pavement was covered to protect it from evaporation during the curing period. The work required 150 cu. yd. of excavation and an equal yardage of gravel, together with 40 cu. yd. of grout. The work was done by a gang of four men and a foreman.

We are indebted for the above information to H. G. Dalton, structural engineer, Chicago, Burlington & Quincy, Chicago.

The Surface of the Pavement Being Leveled off with a Home-Made Float

What One Railroad Has Learned About T

The turntable is in a sense a movable bridge, but unlike its counterpart, the swing span, it is operated under load, so that the center bearing and machinery, as well as its structural members, have been subjected to overloading as the weight of locomotives has increased. For this reason the turntable and its various appurtenances have undergone progressive development, during which many changes have been made. Owing to the serious consequences of a turntable failure, measures designed to insure good operating condition at all times are of vital importance. Because of these considerations this account of the experiences and practices of the Chicago, Burlington & Quincy, with respect to its turntables, should prove of wide interest and value.

THE first turntables used on the Chicago, Burlington & Quincy were timber structures of the "Prairie Type" with an unenclosed roller nest 12 ft. in diameter. These were followed about 1880 by tables of wrought iron construction. Some of the latter, built at the Aurora shop in 1882, are still in service.

All of these iron tables were provided with center bearings of a high pedestal type equipped with either conical rollers or bronze discs on top of the pedestal castings. The roller nests, about 16 in. in outside diameter, consisted of 15 conical rollers held in position by inside and outside rings and rolling between upper and lower bearing discs of steel, while the bronze discs were 8 in. in diameter and had spherical top surfaces. Structural steel was first used in turntables about 1884.

As the weight of locomotives increased, the bearing pressure on the small pedestal-type centers increased to such an extent as to result in rapid wear of the bearing surfaces and led to the development of the large roller centers of various types. These larger roller-type centers were of the same design as described above except that the rollers were made longer and of larger diameter and more of them were provided. However, this improvement did not end the troubles, as the surfaces of the rollers continued to flake and wear, leading to hard turning of the tables and frequent replacement of the rollers. The subsequent substitution of rollers with chrome nickel steel treads resulted in a decrease in the cost of inspection and repairs and greater ease of operation. In all of these earlier tables the top of the center bearing was approximately at the level of the bottoms of the main girders so that the load could be applied to them through steel cross girders.

Further increase in the weight of locomotives led, in 1906, to the design of a center bearing embodying a lenticular bronze disc supported in a cast steel bowl filled with oil. A pipe extending from the deck afforded a ready means of replenishing the oil. Turntables equipped with centers of this type had a tendency to tip laterally under load with the effect of considerable wear and tear on the side balance wheels provided on the center. This side tipping also resulted in an unequal distribution of the load on the end-carriage wheels with an attendant increase in friction and, in some cases, in broken wheels, bearing boxes and end-carriage connections to the main girders.

New Flat Disc Center

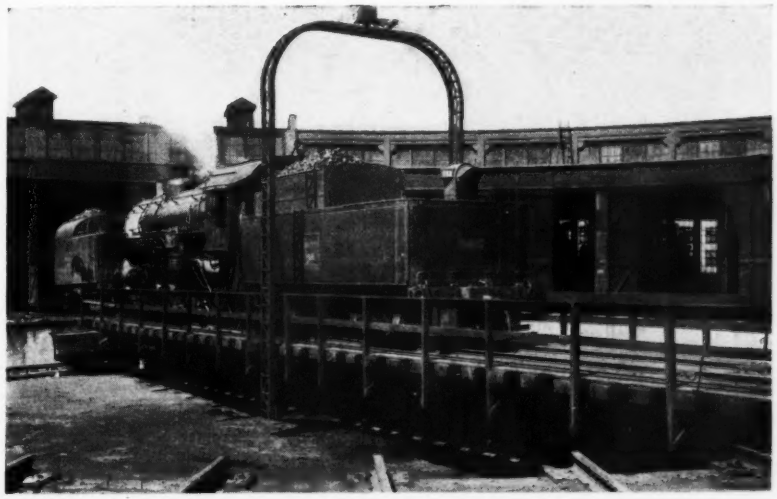
To provide greater lateral stability, a center with a flat disc was developed in 1914, particular attention being given in this design to ease of removal for cleaning and inspection of the parts. This bearing was oiled by means of a force pump placed on the deck. Here again, experience disclosed pertinent information. It was found that the bearing surfaces of the bronze disc as well as the upper and lower steel discs had to be hand scraped to eliminate all high spots, and that the surfaces must be given a good polished finish after the machine work is completed. If this fine finish were not provided it would only be a question of time before the surface would cut and bind, and cause hard turning. Cleaning of the surfaces is also important to prevent hardening and carbonizing of the oil.

In these centers, the confining ring or bowl was made in two parts with

A 70-ft. Deck-Type Turntable Recently Taken out of Service at Downers Grove, Ill. (Below) and the Conical Roller Type Center that was Used Under this Table (Right).

Turntables

By F. H. CRAMER and W. McCREADY*



Left — 110-ft. Continuous-Type Turntable at Western Avenue (Chicago). Above—A portion of the 150-lb. Section Circle Rail for This Table.

paper liners in the bolted joints between the two halves and between the ring and the base. In time, it was found difficult to hold oil in the confining ring because of loosening in the joints, resulting from movement of the table when engines passed on or off it. The oil force pump worked well, although it required frequent maintenance on the center tubing.

The Latest Type

The latest type of center, used on the Burlington for about four years, is a modification of the flat-disc type that involved some remodeling of the discs and base parts, but with the three discs placed in a cast steel bowl filled with oil through a pipe opening in the side of the bowl. This position of the pipe opening was adopted intentionally so that the man who oils the table must get down to the center where he can check the amount of oil, the accumulation of water, etc., in the bearing. The man in charge of the table or assigned to do the oiling is required to examine the oil every seven days. As a rule, a small amount of oil must be introduced into bearings of this type about once a month.

Turntables installed on the Burlington were of the conventional plate-girder type until 1907, when the first through-truss table was built. The through-truss design proved less expensive when increasing lengths of locomotives demanded tables 80 ft. or more in length, because of the excessive depths required in plate-girder designs for the longer tables. The through-truss type also effected a considerable saving in excavation and height of curb wall and, in some locations, obviated drainage difficulties that could not be avoided in pits of the depth required for a deep girder table.

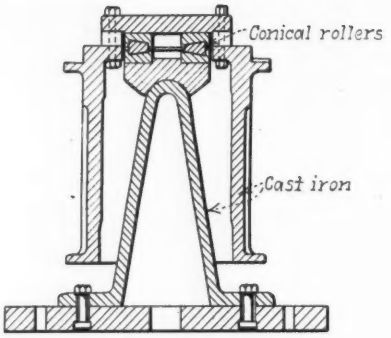
The Burlington installed its first 100-ft. through-truss turntable in 1914, embodying a flat-disc center and end carriages having 30-in. wheels with phosphor-bronze bearing bushings. The adoption of bronze bushings afforded easier application and removal and longer service than could be obtained from the old babbitt type of bearing.

At present, tests are being conducted on three types of alloy steel end-carriage wheels. The investigation has not been completed but it promises superior service from these wheels. This experiment was undertaken because the end wheels of balanced tables receive severe shocks, and at some of the busy terminals they are subjected to heavy wear due to the fact that engines are not always perfectly balanced on the table when they are turned. Failure of the older type of steel wheels is always indicated first by a rolling down of the treads, followed by the breaking off of sections of the tread. The first of these alloy steel wheels were installed at a busy terminal in 1932 and to date they show no signs of failure. In the small girder tables, excessive wear occurred in the upper bearing boxes of the end carriages, but this has evidently been overcome by the use of Grade 1-A cast iron boxes provided with steel shafts.

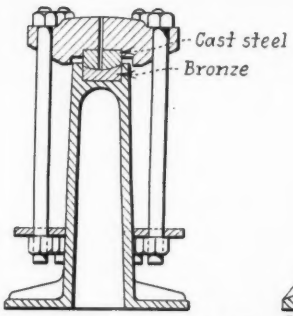
End Carriages Give Trouble

Failures in the through trusses usually occur in the end-carriage girders. While the Burlington has experienced only one actual failure in these, it is deemed essential to check the ends for loose rivets at each inspection. These tables can be adjusted for end clearance by means of adjusting hoods at the tops of the center posts. This adjustment is always checked, not only for clearance

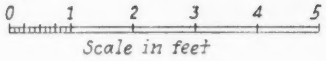
*Mr. Cramer is assistant bridge engineer and Mr. McCready is turntable inspector, Chicago, Burlington & Quincy, Chicago.

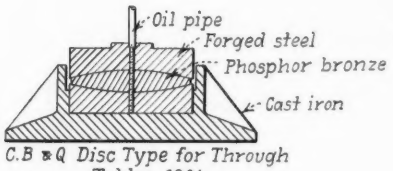


Sellers Conical Roller Type 1880

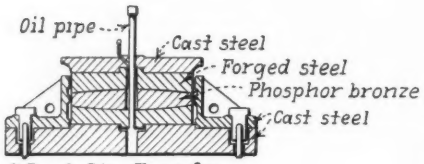


Lassig Type "B" Disc Center

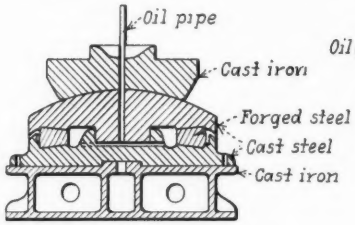




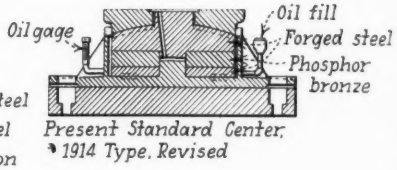
C.B & Q Disc Type for Through Tables, 1906



C.B. & Q Disc Type for Through Tables, 1911.



American Bridge Company Roller Type Center, Interchangeable with C.B. & Q. 1911 Centers



Present Standard Center, 1914 Type, Revised

A Few of the Turntable Centers Used on the Burlington During the Last Half Century.

but to be sure that the end carriage wheels ride level. Improper adjustment results in one wheel carrying more than its proportion of the load.

The first installation of a turntable of the three-point-bearing type on this railroad was made in 1927. This one, 100 ft. long, was followed by three 110-ft. tables of the same type in 1931. However, the three-point bearing principle was applied, in part, to an existing table in 1929, for the purpose of enabling it to handle locomotives of such length that complete balancing was not possible. To reduce the power required to turn this table with considerable load on one end carriage or the other, the wheels were provided with roller bearings, and by designing these bearings to fit the existing carriages, the installation was made without extensive structural changes. Since that time a number of other tables have been converted to the three-point type, applying roller bearings to the end carriages and also lowering the center bearing so as to develop reaction at the ends as well as the center.

Power Plants

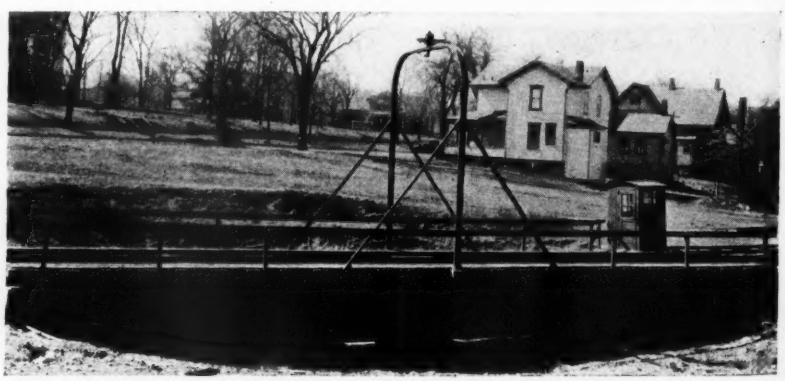
In the early days all tables were turned by hand, but as the roundhouses became equipped with air facilities the tables at the more important terminals were equipped with small air motors to turn them. This type of power is still serving well at many points, but where the size of engines has increased larger power units had to be installed. In the meantime, practically every roundhouse with turntable facilities has been electrified, so the adoption of electric power for the larger tractors necessary to handle the heavier and longer engines, as well as the correspondingly longer tables, was a natural consequence.

To employ larger air motors in most cases would have necessitated larger compressor and storage capacity and entailed increased operating and maintenance costs. As a consequence power-operated tables originally turned by air power were provided with electric power as the weight of locomotives increased. All of the first air-operated tables and many of the electric-operated tables were first supplied with power through underground lines that were carried up through the center bearing. Of late years, most of these have been changed to overhead lines to eliminate underground trouble in repair work and to save time in raising the tables for inspection or repairs. So far as possible, all power lines are carried to the table on poles rather than from a nearby building, to decrease the hazard of an interruption of service in case of a fire.

Dual Power

The turning of the unbalanced gas-electric motor cars on small branch-line tables has been solved by designing a combination air and electric tractor, using air from locomotives when these are being turned and plugging in an extension cord to the car power unit when turning motor cars, since these cars do not furnish a sufficient volume of air to operate an air tractor. The standard air power tractors are equipped with the containers and necessary valves for the use of alcohol during cold weather.

It should be noted that the Burlington practice is to provide just suf-



A 69-ft. Deck-Type Turntable at Aurora, Ill. Note Frame for Delivery of Power.

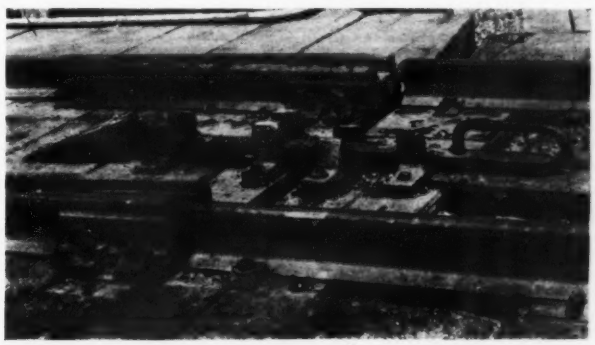
ficient power to operate the table in cold weather without trouble. An excess of power is costly because turntable operation presents a very low load factor, with the result that the demand charge exacted by the electric service company may constitute the major element of the cost of the power used.

The standard deck is of 8-in. by 16-in. stringers, laid solid and with full length timbers so that no sidewalk is required. The standard end ties are steel wide-flange beams bolted to the top flanges of the main girders. A recent change in deck standards eliminates the use of sheet lead and sheet zinc as steel protection and substitutes a covering of wrought-iron sheets over the main girders.

Responsibility for the maintenance of tables is divided between the mechanical department, which looks after tractor repairs, and the bridge and building department, which handles all other maintenance. The painting of tables is done by division forces in some cases, but in general by floating paint gangs.

Until about fifteen years ago all tables were raised and the bearings cleaned four times a year. However, as improvements were made in the design and construction of the tables, these complete inspections were reduced to two a year and finally to one a year for the principal tables and once every second year for branch-line tables.

An 80-ft. Turntable Recently Installed at Downers Grove, Ill., to Replace a 70-ft. Table.



Type of Lock Used by the Burlington on Some of the Smaller Turntables.

During these inspections, which are made by a representative of the bridge engineer, the table is raised so that the center bearing may be opened for examination and cleaning. Any repairs that do not involve the use of new materials are completed on the same day, while any further repairs or improvements relating to the structural, electrical or mechanical features of the table that the inspector deems necessary, are covered in a report that he forwards to general and division officers. After the work has been authorized, the division master carpenter is required to report monthly to the bridge engineer on the progress made until the work has been completed.

Supplementing this inspection, the master carpenters are required to make examinations of the turntables in their territories at intervals of about six months. While these inspections are made without raising the superstructures to permit opening the center, they are required to prepare and forward reports as in the case of the more complete inspections.

The raising of a table, its inspection, and the cleaning of the center bearing are usually completed in less than two hours so that table can be restored to operation as soon as possible. Following this, the bridge gang makes necessary repairs, or, if no repairs are required, the men are released for other work, while the inspection of the table is completed jointly by the inspector and the master carpenter.

The inspections are made in considerable detail, as it is of first importance to guard against turntable failures or delays during the year. The annual inspections cover all points of operation and maintenance, such as the condition of the center bearing, end bearings, etc. It also involves the checking of clearances; the condition of the table rails; the position of the house-track rails, both for end clearance and for height; the inspection of important rivets (end-carriage connections, especially); the condition of the circle rail and ties; the condition of the paint, particularly on the top struts of through-truss tables where gas action is most destructive; the condition of roller bearings in end wheels; and a thorough inspection of the tractor and a test of its operation with a locomotive spotted on the table.

Lubrication

The problem of proper lubrication of bearings has been given a great deal of consideration, as it is realized that many expensive repairs can be avoided by the use of the correct lubricant. At the present time the Burlington uses a saturated valve oil in all disc-type centers and a certain grade of grease in power-operated roller-type centers, while on hand-power tables valve oil is used during warm weather and ice-machine oil during cold weather. The disc type centers require a heavy full-bodied oil possessing adhesive properties. This has been proved by tests, for it has been found impossible to turn some tables under a heavy engine if an oil as light as ice-machine oil is used.

Grease has been found preferable in the roller type centers, as it has the property of sticking to the bearings under all conditions, including flooding in storms, and does not stiffen to any appreciable extent in cold weather. If the use of grease proves as satisfactory as now appears certain, the raising of all tables equipped with the roller-type center bearings will be done only every other year.

Builds Slide Detector Fence of Unusual Design

A SLIDE detector fence embodying a new principle in the design of such fences has been installed by the Richmond, Fredericksburg & Potomac in an unstable cut near Cherry Hill, Va. The essential and unusual feature of this fence is that the wire mesh panels of which it is formed are hinged or pivoted about an axis through their top horizontal members so that when slide material presses against a panel it rotates toward the track, causing pull switches in wires extending through the lower horizontal members to become disconnected, resulting in a short in the automatic signal and train control circuits.

The cut in which this unique slide detector fence was installed is located just north of the Cherry Hill station at a point where the railroad's double-track line, which extends roughly in a north and south direction in this vicinity, pierces a hill on the west bank of the Potomac river near the mouth of Powell's creek. This cut, which has a maximum depth of 95 ft. on the side away from the river, has caused trouble ever since it was excavated in 1928-29 in connection with a change of line and the construction of a new bridge across Powell's creek.

The formation responsible for the unstable conditions, which extends along the Potomac river for many miles, comprises a stratum of blue-green marl or clay overlaid and underlaid by sandstone. While the clay is impervious it becomes very slippery when wet, the moisture gaining entrance through cracks or seams. The sandstone is also seamy and, in addition, contains a number of faults, all of which tend to dip toward the river. Moreover, while the sandstone is sound and hard in places, it is soft and disintegrates rapidly in others. The tendency of the clay to slide out from under the sandstone and foul the southbound main line has given considerable trouble in the past and a considerable amount of work, which culminated in the installation of the slide detector fence, has been done on the slope of the cut in an effort to stabilize conditions.

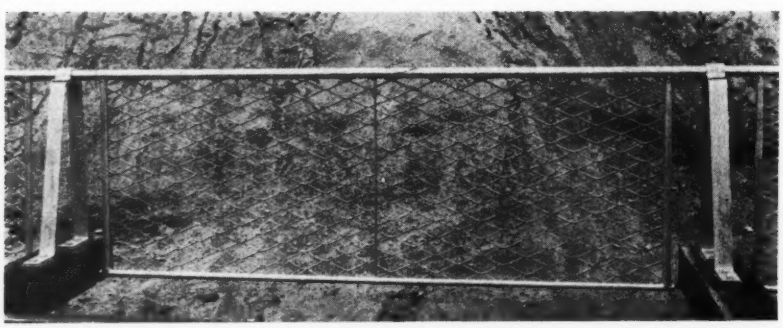
Because of the peculiar conditions existing in this cut it was realized that, if it were to be effective, the slide detector fence must be located close to the southbound main line. Moreover, in view of the necessity of ditching the cut periodically because of erosion, it was desirable to design the fence so that portions of it could be readily removed during the ditching operations. With these considerations in mind the fence described below was designed and installed.

The Fence Is Supported on the Ends of 13-ft. Crossties

The panels of the fence, which are 8 ft. 11 in. long and 3 ft. high, consist of heavy wire mesh stretched over frames constructed of 1-in. and 1½-in. iron pipes with welded joints. Each panel is suspended by the ends of its top member, consisting of a 1½-in. pipe 9 ft. 7¾-in. long, from the tops of posts spaced 9 ft. 8 in. apart, which are supported on the ends of 13-ft. ties. These ties replace standard crossties in the southbound main track and are so inserted in the track that the entire additional length of each tie is available on the west side of the track for supporting the fence.

The posts, which are 2 ft. 6 in. high, consist in each case of a length of ⅜-in. by 3-in. iron strap formed with two upright legs and a 6¾-in. horizontal leg at the top. At the lower end of each upright leg a 6-in. section of the strap is bent horizontal and is bolted to the supporting tie by means of two 13/16-in. lagscrews. For holding the ends of the top members of the panels in position on the posts in such a manner that they are free to rotate, a cap, formed of ⅜-in. by 3-in. strap iron and shaped to conform to the outside diameter of the pipe, is fastened by two bolts to the horizontal leg at the top of each post over the ends of the pipes. With this type of construction the panels can be removed simply by withdrawing the bolts holding the caps on the brackets. On each post the ends of the adjacent pipes are separated by the head of a ½-in. bolt inserted through the top horizontal leg of the post.

The lower horizontal members of the panels serve as conduits for circuit wires, which are cut in on the track circuit that controls signals north and south of the cut. At intervals of 50 ft. the circuit wires are connected to pull switches so that, if slide material pressing against the fence should cause one or more panels to rotate inward through an arc of 10 in. to 12 in. at the bottom, the circuit wires will pull apart at one of the switches, thus breaking the track circuit and setting both signals at the stop indication. As there was an existing automatic signal about a half mile south of the cut governing northbound movements and another signal



Slide Material Pressing Against the Fence Causes the Panels to Swing Inward, Shorting the Track Signal Circuit

about the same distance north governing southbound movements, it was not necessary to change the location of the signals in order to incorporate them in the slide detection system.

The fence was designed and installed under the direct supervision of E. M. Hastings, chief engineer of the R. F. & P., to whom we are indebted for the information contained herein.

Rail Production in 1936 at Five-Year High

THE production of rails in the United States in 1936 totaled 1,219,846 gross tons, an increase of 508,309 tons, or 71.4 per cent, as compared with the production in 1935, according to statistics compiled by the American Iron & Steel Institute. The tonnage of rails rolled last year was, moreover, greater than for any year since 1931, exceeding the production in 1934 by 209,622 tons, or 21 per cent, that in 1933 by 803,550 tons, or 193 per cent, and that in 1932 by 817,280 tons, or 203 per cent.

Increases in the production by weight groups in 1936 as compared with 1935 showed considerable variation, and in one weight group the tonnage produced showed a substantial decline. The weight group showing the largest increase was that comprising rails weighing 120 lb. and less than 136 lb., the increase being from 154,367 tons to 368,470 tons, or 139 per cent. In the "100 and less than 120-lb." group the increase was from 340,800 tons to 611,527 tons, or 79.5 per cent; while production in the "85 and less than 100-lb." group increased from 85,627 tons to 99,961 tons, or only 16.7 per cent. Somewhat surprising is the fact that production of rails in the "136 lb. and over" group, after showing a substantial increase in 1935 as compared with 1934, decreased from 58,858 tons in 1935 to 22,680 tons in 1936, or 61.4 per cent.

As usual, the bulk of the rails rolled in 1936 was produced from open-hearth steel, the tonnage in this classification amounting to 1,185,176, or 97.16 per cent of the total production. The production of rails from Bessemer and electric steel continued relatively insignificant, amounting only to 289 tons as compared with 565 tons in 1935. In addition to these classifications, the total tonnage of rails produced in 1936 included 34,381 tons of rails rolled from old rails, 41,383 tons of girder and high tee rails and 448 tons of alloy steel rails.

Production of Rails by Weight Per Yard

Years	Under 50 lb.	50 and less than 85 lb.	85 and less than 100 lb.	100 and less than 120 lb.	120 and less than 136 lb.	136 lb. and over	Total
1920	489,043	433,333	952,622		729,118		2,604,116
1921	211,568	214,936	902,748		849,566		2,178,818
1922	265,541	274,731	728,604		902,900		2,171,776
1923	272,794	300,907	864,965		1,465,850		2,904,516
1924	191,046	213,274	853,431		1,175,581		2,433,332
1925	163,607	219,648	765,371		1,636,631		2,785,257
1926	197,260	256,287	797,662		1,966,440		3,217,649
1927	161,836	173,257	539,445	1,314,424	617,524		2,806,486
1928	134,197	125,726	465,393	1,203,749	718,428		2,647,493
1929	141,362	102,944	409,628	1,233,599	834,605		2,722,138
1930	95,626	81,299	267,879	835,496	592,933		1,873,233
1931	50,089	25,524	123,398	495,752	462,988		1,157,751
1932	16,655	13,705	28,593	215,091	128,522		402,566
1933	*49,116	†15,413	40,973	154,007	156,787		416,296
1934	*70,085	†17,111	73,639	491,642	325,942	31,805	1,010,224
1935	*57,127	†14,758	85,627	340,800	154,367	58,858	711,537
1936	*96,111	†21,097	99,961	611,527	368,470	22,680	1,219,846

*60 lb. or less per yard. †Over 60 and less than 85 lb. per yard.

Curve Throwing

(Continued from page 337)

to permit the lining operations to start, this work was begun simultaneously at both ends of the curve, using two independent forces which were practically identical as to organization and equipment used. Power pulling equipment consisted in each case of a tractor and a crawler-mounted power excavator. When pulling with the tractors, tension in the cables was created by the forward movement of the machines, while with the excavators the pulling was done by the winding of the cables directly on the hoist drums without passing through the boom sheaves. In addition to the pulling line, each crane was equipped with three lifting cables, each fitted with a hook made from old frog clamps. While these lifting hooks were not brought into use on this particular curve, they were found useful on other lining projects where it was necessary at times to raise the track bodily off the skid rails to permit adjustment of the rather high tie cribs that supported these rails.

In lining the track, the pulling units at each end of the curve were so arranged that the two pulling cables could be fastened to the track at points about 15 ft. apart. Operating in unison, the machines then pulled the track over a distance varying from 4 ft. to 12 ft., depending on the condition of the track. The cables were then released and the machines moved 75 ft. nearer the middle of the curve to the next setting, where the process was repeated. It was necessary to exercise care to avoid kinking the rails. Where the amount of the throw exceeded 39 ft. (the length of the skid rails) the tractors were used to pull the skid rails forward onto the new subgrade after the limit of movement on the rails in their original positions had been reached.

Ballasting

As rapidly as the track was pulled into its approximate final position on the new alinement it was lined accurately to center stakes with lining bars, after which the ties were spaced, the track was gaged, renewal ties were inserted, and the old ties were respiked where necessary. Next, a work train carrying a special grade of coarse screenings passed over the newly-lined track and dumped enough of this material to allow 1,379 ft. of the track to be raised six inches. Several months after the track had been lined over and had become stabilized on the new subgrade the old ballast was transferred from the old to the new alinements. On the remaining 860 ft. of the curve the relined track was surfaced immediately on the original ballast, this material having been cast over onto the new roadbed during the skeletonizing of the track.

The throwing in of this curve required exactly two hours, this being the elapsed time between the passage of the last train over the old alinement and the completion of the lining work. The work of reconditioning the track in preparation for receiving the work train consumed an additional 1 hr. 30 min.

The force employed in relining this curve consisted of an extra gang of 97 men, including the four machine operators, the work being supervised by a foreman and four assistants.

What's the Answer?

What to Do About Gumbo

What difficulties are encountered in maintaining track on gumbo embankments? What can be done to improve conditions?

Cure Water Pockets

By F. B. LAFLEUR
Roadmaster, Southern Pacific, Lafayette, La.

Among the most serious difficulties encountered in maintaining track on gumbo embankments is that of eliminating the water pockets which are sure to develop in this material. Several methods are being used in treating these pockets. French drains are used most commonly. In this method, deep ditches are cut entirely through the embankment, the bottom of the trench being on a sharp grade and well below the lowest point in the pocket. The trench is then backfilled with coarse material having ample voids to permit free drainage. Large stones or gravel used as backfilling will normally provide ample drainage for a long time.

Another method which has been used to advantage is the driving of sheet piling or second-hand crossties in the embankment, parallel to the track and close to the ends of the track ties. The length of the sheet piles and of the ties will be determined by the height of the embankment and the depth of the water pocket. Only rarely will the depth requirement be too great to be met by the second-hand crossties.

Probably the most effective method of treating water pockets in gumbo embankments is to remove all of the ballast from under the track, extending to the bottom of the water pocket. At the same time the embankment material on both sides of the track should be removed to the same depth, and both the ballast and earth should be replaced with a stable material which does not take up water as gumbo does and which is less plastic when some moisture has been absorbed. Ample time should be allowed for settlement before the track is reballasted. On the face of it this appears to be a rather expensive operation, and it does cost something to do it, but any method of correcting water pockets costs money; yet it has been found much cheaper in the long run than to try to maintain the track, making no effort to cure the trouble.

Ballast Settles

By F. T. DARROW
Chief Engineer, Chicago, Burlington & Quincy, Chicago

One difficulty encountered with this material is the tendency of the ballast to settle into the embankment when it becomes moist. Another is the tendency of the track to go out of surface when heavy trains move over the softened embankment. This usually takes the form of pressing the ballast into the roadbed, particularly under the rails, and of crowding the shoulder of the embankment out horizontally and sometimes upward.

Improvement is accomplished by replacing the soft material of the embankment under or alongside the ballast with material that is firm, even when moist. This may require the removal of the gumbo shoulder and its replacement with improved material, or drainage of the pocket of ballast where it is impacted into the embankment.

Other cases have been corrected by burning the gumbo to a brick-like condition. This trouble has also been prevented in gumbo soils by depositing 8 in. to 1 ft. of sand on top of the embankment before placing the ballast and track, together with suitable provision for drainage of the sand

Send your answers to any of the questions to the What's the Answer editor. He will welcome also any questions you wish to have discussed.

To Be Answered in July

1. *When ballasting follows rail renewal, should the rail be regaged in connection with the ballasting?*
2. *When vertical settlement occurs in a masonry pier from overloading of the foundation, what remedy can be applied? How should the work be carried out?*
3. *Is it practicable to tamp with ballast forks? If so, what is the minimum lift? If not, why? Does the kind of ballast make any difference?*
4. *What causes parts of repainted wood surfaces to fade more than others? How can the trouble be remedied?*
5. *What methods can be employed to induce the growth of grass on slopes of cuts and embankments? What varieties of grass are best suited for this purpose?*
6. *How long should the stroke of a deep-well pump be? What determines this? How does one adjust the length?*
7. *What advantages, if any, are there in distributing ties by special gangs on a system or regional basis? When should they start?*
8. *What power tools can be used to advantage in the repair of timber bridges? For what operations is each best adapted?*

thus placed. The trouble manifests itself in various ways, so that each case usually must be given individual treatment after careful study.

Drainage Imperative

By E. E. Barton
Roadmaster, Chicago & North Western, Rapid City, S.D.

Unless care has been exercised during construction to avoid the mistakes that are so commonly made in constructing gumbo embankments, and to provide all needed drainage before the ballast is applied, maintenance of the track may become difficult in the extreme. Again, the kind of ballast to be used is of paramount importance in avoiding water pockets in gumbo roadbed.

Gumbo is characterized by high absorptive capacity and when moist, well below the point of saturation, becomes quite plastic. If, therefore, the construction of the embankment or the character of the ballast is such that the water does not drain freely and rapidly, water pockets are likely to develop quickly. After a water pocket has once started, there is a constant movement of the plastic gumbo from the bottom of the pocket toward the shoulder of the roadbed. This can be detected easily by the outward movement of the subgrade, which may amount in some instances to as much as 8 to 10 ft., and in more aggravated cases may eventually result in embankment slides.

In the early stages, this movement takes place only during the wet season. During these periods the track goes out of line and surface rapidly. As time advances the condition becomes more aggravated and may become chronic, when no amount of effort will keep the track in good-riding condition.

Other characteristics of gumbo are that as it absorbs water, it swells; that as it dries, which it does slowly for it holds water tenaciously, it shrinks correspondingly; and that its plasticity increases with the temperature. All of these characteristics combine to present a real problem with respect to stabilization. Based on these characteristics, either of two courses may be followed in applying corrective measures. The first is predicted on the need for removing water rapidly from the subgrade, once it has gained an entrance. The other affords a means of preventing the entrance of water into the subgrade.

In the first case, lateral drains are constructed to provide the needed artificial drainage. These may be either French drains or perforated corrugated pipe. If the condition is of long standing, the French drain will probably be better at the start because soil movement may make the pipe ineffective. As a permanent drain, the pipe is superior.

Prevention is always better than cure. For this reason a topping or covering of the gumbo roadbed, preferably during construction, with a stable earth, such as silt, black soil, etc., which will turn rather than absorb water, thus keeping it from the subgrade, is an almost certain preventive. After the line is in operation and the pockets have formed it will be expensive to place such a cover, but in many instances the expense of doing so will be fully warranted.

This topping should not be skimped. The roadbed should be covered over its entire width to a depth of say 20 in. The important thing is to keep moisture from getting into the underlying gumbo. After the topping has compacted, any ballast that is satisfactory elsewhere can be used without danger of water pockets, provided care is taken when the ballast is applied not to create depressions in the surface of the subgrade.

Efficiency at Water Stations

Is it practicable for local forces to determine the efficiency that is being obtained from fuel or power consumption at a water station? How can this be done?

They Lack Data

By E. M. Grime
Engineer of Water Service, Northern Pacific, St. Paul, Minn.

Ordinarily, the local forces do not have the complete data required to determine efficiency for such plants, except possibly on very simple cases; it is necessary to have all of the characteristics of the plant determined first by the engineering department. In simple words, efficiency is the result obtained by dividing the effective work produced by the plant in terms of watts or horsepower by the various elements of power which are required to produce the desired result. It is necessary, therefore, to have the total dynamic head and the exact quantity of water pumped from the source to the storage tank in a given period of time and to know the power which this required.

If the efficiency of the pump only is desired, we can start with the power delivered to the pump by a motor of known efficiency. The horsepower delivered will be the product of volts times amperes times the efficiency of the motor, divided by 746. The horsepower produced will be the gallons pumped per minute times the weight per gallon (8⅓ lb.) times the total dynamic head, divided by 33,000. If a fuel-oil or a steam engine is the power unit the determination of the power input becomes more difficult, because of the varying factors characteristic of these types of prime movers.

If the overall efficiency of an electrical pumping unit is desired, in most cases it will be satisfactory to determine the power input by counting the revolutions of the meter disc and then use the meter multiplies to obtain the total input. The generalizations which have been mentioned can also be found in the catalogs of some manufacturers, as well as in text books. It is the unusual arrangements that exist at some plants that make it necessary to have a preliminary survey by the engineering department. This survey should produce the data necessary for an efficiency test, which, among numerous details, will usually include the following:

Suction lift under varying pumping rates; discharge head; friction in the pipe lines under varying pumping rates; capacity of the storage tank or receiving reservoir; length of the discharge and suction lines; elevations of the water level in well or sump; elevation of the center of the pump discharge; and elevations at the storage tank or reservoir.

In the space available it is impracticable to mention all of the numerous details which will be encountered when making an efficiency test. One of the most important details is the total dynamic head. As the test will presumably be made under regular

operating conditions, several observers will be required to obtain simultaneously suction and discharge heads, quantity of water pumped in a given time and a complete record of the power input.

Can Get Roughly

By Water Engineer

Efficiency is measured by the ratio of useful work to the energy consumed. To obtain this ratio, even roughly, the local forces must have certain information which they are not likely to possess. Assuming that this information can be made available to them, and that only a rough estimate of the efficiency is required, I believe that they can get this in some cases, particularly if only the overall efficiency of the plant is in question; in others it will be impossible for them to make the determination.

If the efficiency of the individual units is desired, the problem becomes more complicated and thus farther removed from the ability of the local forces. When I say ability, I am including the time required to make the tests and the later calculations, the number of observers needed and the equipment necessary to take some of the measurements. If the boiler of a steam plant is to be rated, the thermal content and amount of coal burned, the amount of water evaporated, the stack losses and the standby losses, if any, must all be known. To obtain the efficiency of the pump one must have some means of measuring the amount and temperature of the steam delivered to it. Obviously, the local forces cannot be expected to be in position to obtain these data with any degree of precision. In addition it takes time to make these tests, and the local forces are seldom able to spare this time from their other duties. In fact, I would say that if they do have the time, the organization on the division will bear investigation.

To only a slightly less extent, these conclusions will apply to those plants where power is supplied by internal-combustion engines. In fact, complications are introduced by this power unit which make it less likely that the local forces will be able to make the determination. Determination of the overall efficiency of the average plant where pumping is done by electricity is somewhat simpler, particularly if the power is metered separately for the plant. Otherwise, the electrical department should be called on to measure the power input.

After the power input has been determined it is also necessary to know how much work is being done, and this requires a large amount of information concerning suction and discharge heads; size, length and condition of the discharge lines, etc.; as well as a number of observers to record the test data simultaneously. On the whole, I would say that it is impracticable for the local forces to determine with any degree of precision the efficiency of pumping plants, although dependable rough estimates of the overall efficiency can often be made with little difficulty.

Telephones for Bridge Gangs

Should bridge gangs be equipped with portable telephones? What are the advantages and disadvantages?

Should Be Equipped

By S. F. Grear
Assistant Engineer of Bridges, Illinois Central, Chicago

All bridge gangs should be equipped with portable telephones, as this will enable the foreman to keep in close touch with the dispatcher and thus avoid delays to the work as well as to trains. Our road is largely equipped with telephone lines, both for dispatching trains and sending messages. On some of our lines permanent telephones are installed at siding switches, and thus eliminate the need for the portable type of telephone. On long jobs it is advisable to cut in permanent phones rather than to depend on the temporary installation over a considerable period.

While working on the main line with a derrick or pile driver, the conductor-pilot can keep himself informed constantly of the movement of trains if a temporary telephone is available for his use. He is thus able to keep the foreman advised as to how much time he has for making changes or doing other work which would obstruct the track, without delaying traffic.

Portable telephones are not used as much as they were formerly, because permanent telephones are now more readily accessible and are more satisfactory. In many cases, however, the work is far removed from these permanent telephones, and the temporary set can be used to real advantage. It must be kept in good condition, with tight connections, or it will interfere with other use of the wires.

To insure proper attachment of the portable telephone, the foreman must have a diagram of the wires at the particular point where the attachment is to be made, to insure that it will be connected to the proper wires. Care should be exercised to make the installation correctly and to use the instrument in such a way as not to interfere with the dispatching of trains. It should not be used indiscriminately, but only when other means of communication are not available and then only by men thoroughly familiar with its use. No information obtained by telephone shall be construed as relieving the foreman from responsibility for fully protecting his work in accordance with flagging rules.

Considers Them Necessary

By T. P. Soule
General Supervisor Bridges and Buildings, New York Central, New York

A portable telephone should be a part of the equipment of every bridge gang, ready for immediate use whenever the occasion arises. There is a definite advantage in having equipment which will enable the foreman to get into touch with the dispatcher without having to leave his work. Furthermore, by means of the telephone constant communication can be maintained when conditions make this desirable.

If a job is under way which requires the track to be taken out of service temporarily, and the foreman does not have a portable telephone, it will be necessary for him to leave the work, usually at a time when it is most desirable that he be directing operations personally, and go to the nearest telegraph office, perhaps several miles away, and get permission to cut the track. He must then return to the job before the work can be started; after the track is restored, he must again go to the telegraph office to notify the dispatcher.

Obviously much valuable time is lost in making these trips, the productive time of the gang being reduced correspondingly. Indeed, where a gang is working on a narrow margin of time, the time required to go to the telegraph office and return to the work may be enough to prevent the work being started at the time the gang is ready to undertake it. A portable telephone will eliminate all of this lost time and permit immediate

communication with the dispatcher at any time this becomes necessary.

Portable telephones are often of considerable value in connection with the operation of motor cars, particularly where the movement of these cars on single track must be made under train orders. On multiple-track it is sometimes necessary for the bridge foreman to get permission from the dispatcher before he is permitted to place his car on the track. In either case, the value of the portable telephone is obvious.

Renewing Cementing Gravel

Where stone ballast is applied over cementing gravel on a soft roadbed, what should be the minimum depth of the new ballast? Why? Should the track be skeletonized before the stone is applied? Why? How is this done?

Not Less Than 8 to 10 In.

By P. T. Ronbinson

Engineer Maintenance of Way and Structures, Southern Pacific, San Francisco, Calif.

Where stone ballast is applied over cementing gravel on a soft roadbed, the minimum depth of the new ballast should be 8 to 10 in. No greater depth is desirable, for since the roadbed is soft and yielding, the ballast will need to be reinforced from time to time, and until it becomes stable this depth should be ample.

The old ballast should be dug out to the bottom of the ties before the stone is applied. If this is not done the stone and the cementing gravel will become mixed and will not allow proper drainage. This skeletonizing should be accomplished in the ordinary way with a pick and shovel.

On the other hand, corrective measures should be taken to eliminate the causes of the soft roadbed, either by drain tunnels or adobe soil stabilization. Until the roadbed has become stabilized it will be useles to apply a high-grade ballast. For this reason, the placing of crushed stone on top of the cementing gravel under the conditions imposed in the question, will be a waste of money.

Several Factors Involved

By T. M. Pittman

Division Engineer, Illinois Central, Water Valley, Miss.

Several factors are involved in determining the depth of the new ballast, including the degree of softness of the roadbed, the depth of the cementing gravel and the volume of traffic. In this case it is assumed that while soft, the roadbed is stable enough to justify the change to rock ballast and that the volume of traffic is great enough to make this change necessary. Under these conditions, the chief function of the rock ballast, aside from providing an even bearing for the ties, will be to distribute the wheel loads to a wider area and thereby reduce the unit pressure that is imposed on the gravel.

The bed of cementing gravel will act as a roof to shed water to the sides of the track. If this roof is crushed in, water will enter the roadbed and cause continuous trouble. The controlling requirement for the new ballast will be, therefore, that it distribute the load so that this roof will not be broken. Any depth great enough to serve this purpose will serve all of the other requirements. Where the cementing ballast is deep and strong, satisfactory results can be obtained with 4 in. of crushed rock under the ties. This should be increased by subsequent surfacing to 6 to 8 in.

By all means, the track should be skeletonized before the stone is applied. The material thrown from the cribs should be placed on the shoulders to build up the subgrade and help to carry the water farther from the track. A mixture of stone with cementing gravel does not make a satisfactory ballast, and difficulty will be experienced in maintaining the track in smooth riding condition on such a mixture. The benefits derived from skeletonizing the track will more than offset the cost of doing so.

Ordinarily the track is skeletonized with pick and shovel, although recently a machine has been developed which will perform a large part of the work in certain types of ballast. The cost of skeletonizing will be considerably less in the spring while the track is still soft from winter rains, than it will be after the hot dry weather of later months has caused the gravel to set. Ample precautions should be taken to avoid buckling while the track is open, and advantage should be taken of the open track to make necessary tie renewals.

Numbering Bents on Trestles

What advantages, if any, are there in numbering the bents on long trestles? How should the numbering be applied on creosoted trestles?

Benefits Obvious

By W. J. Howse

Bridge and Building Foreman, New Orleans & North Eastern, Poplarville, Miss.

The importance of numbering the bents in long trestles is obvious. The practice is of special benefit to the bridge foreman and inspector, since it facilitates the prompt location of any part of the structure when approached from either end. Another advantage is that a bridge inspector can start and stop his work at any point on the structure without the necessity of recounting the bents previously inspected when he resumes his work. This is no small matter on bridges ranging from 100 to 300 bents, or even more.

Several methods have been used to indicate the numbering, but I prefer to use 4-in. stencils and white-lead paint, applying the numbers to both side faces of one end of the caps near the top edge, provided the creosote is not exuding in such quantity as to blur the figures. Where this occurs I suggest the application of metal numerals. My experience with the white-lead stenciling has been quite satisfactory, for in many instances the numbers remain legible during the lifetime of the structure.

Is Standard Practice

By L. G. Byrd

Supervisor Bridges and Buildings, Missouri Pacific, Poplar Bluff, Mo.

It has been our practice for many years to number the bents of all trestles, both treated and untreated, when the number of spans exceeds 15. The numbers are stenciled on a piece of 10-gage tin 3½ in. by 8 in. The figures are white on a black background and measure 2 in. by 2½ in.

The metal sheet is then attached to one side of the cap on the right-hand side of the trestle when facing in the direction the mile-post numbers increase, by means of small nails. This attachment is made every tenth bent.

We find that the numbering is of considerable advantage when writing our notes on the annual and semi-annual bridge inspections, because it gives accurate information as to the particular section of the structure which needs attention. It is of further advantage in that the foreman is able to find quickly the particular member or members which need attention. It is also of particular advantage when some defect is detected from a moving train. Locomotive engineers sometime drop notes to bridge and building or section foremen reporting conditions which they have discovered, and much time is saved because they have learned to refer to the numbering.

Spot vs. Group Tie Renewals

What are the relative advantages and disadvantages of spot and group renewals of ties? Under what conditions can each method be applied to best advantage.

Prefers Group Renewals

By Henry Becker
Section Foreman, St. Louis-San Francisco, Rush Tower, Mo.

Obviously the group method is not adapted for these cases where the number of ties to be renewed per mile is small. Both experience and observation indicate that this method is preferable, however, where the renewals are heavy enough to justify a light general raise, say about 2 in. One of the principal advantages of this method is that since it is not necessary to disturb the old bed and every tie is tamped, all of the ties will have a uniform bearing and the track will ride much better than under any system of spot renewals with which I am familiar. Furthermore, after the track has been given a general surface it will remain in good riding condition with minimum attention, thus offsetting to some extent the additional cost, if any, of applying this method.

When ties are spotted in without raising the track, it is almost inevitable that the old bed will be disturbed, and in many instances it will be destroyed. The new tie is usually deeper than the one it replaces, which is one reason why the old bed is ruined so many times when spotting ties. Even if it has not been necessary to disturb the bed to insert the new tie, the tie will be snugly on the old bed, and one cannot tamp it without breaking the bed, for to do so requires sufficient space to get at least the average-size ballast under the tie.

I realize very definitely that group renewals are not always practicable and that one must follow the method which is most reasonable under the conditions which must be met. Where conditions permit, however, group renewals can be made at a lower unit cost and the track will remain in better condition for a longer time than if the renewals are made by the spot method.

Favors Spot Renewals

By E. P. Safford
Supervisor of Track, New York Central, Silver Creek, N.Y.

Where normal annual or biennial tie renewals are being made, I am strongly in favor of the spot method. Tracks may be kept safe and in good condition where treated ties are used, as is now the general practice, by renewing ties in one-half of the track each year. That is, on single track, one-half of each section can be renewed; on multiple track, the eastward or northward tracks can be given attention one year and the westward or southward tracks the alternate year. The renewals should start as soon as possible after frost is out of the ground and the necessary smoothing has been completed.

Some of the reasons why tie renewals should be begun early are that the ballast works more freely in the spring, allowing more rapid progress with the same effort; the days are cooler, and the output per man-hour is greater; the new ties are used promptly, the old ones are disposed of and the right of way is cleaned up early. Again, the ties are in the track before they are subjected to the hazard of grass fires.

When making spot renewals, one should avoid digging the trench deeper than necessary to slip the old tie out and the new one in. The old bed should be leveled off to permit free tamping under the new tie when in place. It is not necessary to preserve the old solidified bed, because if this is done the new ties will make permanent humped spots with swinging ties on each side of them, because insufficient room has been left for good tamping.

Where rail is to be laid and the ties spaced, or the track is to be ballasted, all of the ties will have a new bed and the conditions are changed. When spacing under new rail, the new ties should be slipped into place while the track is raised for the spacing operation. When ballasting, the tie renewals should be made on a light raise just prior to unloading the ballast. In any such operation where there is a heavy tie renewal, group renewals are desirable, entailing prompt resurfacing at the same time.

Creosoted ties should have an average life of 20 years or more. In spot renewals, therefore, only 1 tie in 20 will come out each year, on the average, and the tie condition will be maintained at from 85 to 95 per cent. In group renewals, as they are usually understood, the track is worked over from time to time, at relatively long intervals. Each time this is done, the tie condition is brought from some indeterminate minimum to approximately 100 per cent.

Depreciation sets in at once and continues until the next overhauling. During the latter part of the interval many of the older ties are becoming spongy and this is reflected in the riding condition of the track. When the cycle is completed, a considerable number of ties will be removed which would not have been necessary under spot renewals, but which are not quite good enough for reuse in less important tracks. All things considered, I am convinced that the spot system of renewals is preferable, because where it is followed one can maintain superior track at minimum cost.

Both Have Advantages

By W. H. Sparks
General Inspector of Track, Chesapeake & Ohio, Russell, Ky.

So many factors, other than those relating to the ties themselves, affect the method of making tie renewals that no categorical statement can be made that this or that method is superior. Perhaps this is one of the reasons why this subject has been debated for so many years. Among the advantages of spot renewals, the tie condition can be kept more nearly uniform, since the ties are renewed on an annual basis and at the end of the renewal season each year there should be no ties in the track that are ready for removal. It is also claimed for this method that the ties have a longer life, although I have

no information to confirm this. Obviously, a certain amount of smoothing will be necessary, but in most instances the smoothing would have been necessary aside from any question of tie renewals.

If for any reason the number of ties to be renewed is large, the group system is to be preferred. This method should never be employed, however, unless the track is given a general surface, for no amount of smoothing will restore the track to good riding condition where the renewals are heavy, unless the track is first given a general raise.

Preframing Building Lumber

To what extent is it practicable to frame lumber for railway building before treatment?

Does Not Preframe

By A. T. Hawk
Engineer of Buildings, Chicago, Rock Island & Pacific, Chicago

On the Rock Island we endeavor to provide adequately treated lumber for sills, joists and other parts of buildings that come close to the ground. We also use treated lumber for all of our exposed raised platforms. We do not attempt to frame any of this lumber before it is treated and we do not believe that it is ordinarily necessary for work of this class.

Some of our neighbors use a brush application of preservative or a dip treatment. This is done after the timbers are framed and, while it will not assure as long a life for the lumber as a treatment which gives thorough impregnation, it does add to the life of the timber as compared with no treatment. Obviously, however, it is more or less a temporary makeshift for real treatment.

Some railways are using creosoted tubs for their water tanks. In this case the staves and bottoms are, or should be, preframed and given pressure treatment.

Some Misapprehension

By Engineer of Buildings

Some misapprehension has existed in the past with respect to the use of treated lumber in buildings, primarily with respect to creosote treatment, which has in considerable measure retarded its use. Experience has shown that it is entirely practical to use creosoted lumber for all parts of a frame building up to and including the sub-floor. This includes sills, joists and sub-floor, and it may also include foundation posts and footing blocks, if the building does not set on masonry, and skirting, provided it is not to be painted.

This misapprehension has been most largely with respect to the odor that may permeate a building in which creosoted material has been used. It is true that for some time after the building has been completed, the odor of creosote can be detected, but it is generally so slight as not to be objectionable and it usually disappears after a few months. On the other hand, if the building has been kept closed or is poorly ventilated, the odor of the creosote will be much stronger and may be objectionable, particularly if one is sensitive to the odor, that is, is allergic to creosote.

To avoid objectionable odors, it is necessary that certain precautions be observed. An empty-cell process should be used to eliminate the probability that creosote will exude from the lumber after it is in service. The lumber should be allowed to dry in the open air for a sufficient time after it comes from the cylinders to insure that the surface will be dry before the lumber is applied in the structure.

This requirement for the seasoning of the treated lumber has also been a factor in more than one instance in making it impracticable to use treated material in railway building construction. Seemingly, some railway officers do not or cannot make up their minds as to what they want until the last minute. Then they are in so much of a hurry to get into the building that it is impossible to go about its construction in an orderly manner. I have had to contend with this practice and I know other building engineers who have labored under the same difficulties. If best results are to be attained in building construction, we should be allowed sufficient time to treat the lumber and let it season properly before it goes into the building. Otherwise it will be better not to treat it.

Creosoted lumber cannot be used for any part of a structure that is to be painted or for members that will come in contact with plaster. Finish lumber should not be nailed directly to creosoted members, for if it is it may be expected that the creosote will follow the nail and stain around the head. It is not good practice to place creosoted lumber where it will be heated. If it is necessary to do so, it should be thoroughly insulated from the source of the heat.

Creosoted lumber can be used for studding, provided blind nailing strips are used between it and the finish lumber, and if through this or some similar means the studding is isolated from the plaster. This use is particularly desirable in sections which are subject to heavy termite infestation. If the use of creosoted material above the sub-floor is not considered practicable, the remainder of the material entering the structure can be treated with zinc chloride. While this preservative is not considered to be so certain a repellant to termites, it has given excellent results in certain well-known cases.

Must Have Plans

By L. G. Byrd
Supervisor Bridges and Buildings, Missouri Pacific, Poplar Bluff, Mo.

To preframe building lumber it is just as necessary to have plans showing accurately the dimensions of the various members as it is to have a framing plan for a bridge that is to be preframed and treated. If such plans are furnished, I can see no more difficulty in preframing building lumber than in doing the same thing with bridge timbers.

Usually, the amount of treated material entering into the construction of a building will vary somewhat with the location, the character of the construction and the use to which the structure is to be put. It is our practice to use treated lumber for foundation posts, blocking, sills, floor joists, skirting and decking for all loading and unloading platforms. We have not found it necessary to go into the treatment of lumber for buildings, beyond footing blocks, foundation posts, sills, floor joists, studding and skirting, and such decking as it is practicable to frame before treatment.

Not Always Practicable

By Frank R. Judd
Engineer of Buildings, Illinois Central Chicago

While the desirability of framing lumber for buildings before it is given preservative treatment is not debatable, it is not always practicable to do so. Much depends on whether the work is of a character which will allow the time to be taken, which is

necessary to frame the lumber and pass it through the treating plant.

After the work has been authorized, it generally develops that the date of completion is paramount and must take precedence over all other factors. The result is that advantage must be taken of all practical short cuts to insure the quickest completion of the structure so that it can be turned over to its prospective occupants at the earliest possible date.

Obviously, such requirements cannot be met if the material must be framed and treated unless the lumber is handled through the plant on a special order, thus causing a marked increase in its cost. In view of these conditions it is usually more practical to take the lumber from treated stock and frame it after it reaches the job. For best results, however, the lumber should be framed before treatment whenever it is possible to do so.

How Much Preparatory Work?

Where rail is being laid in an operated track, what limitations should be placed on the advance removal of spikes? Of bolts? Why?

Must Be Watched Closely

By W. H. Sparks
General Inspector of Track, Chesapeake & Ohio, Russell, Ky.

This is a matter that touches very closely the safety of train operation, for which reason it should be given the most careful attention at all times during the working period. In the first place, no bolts or spikes should be removed until the track has been covered by the necessary slow order for the working period, and until it has been placed under flag protection.

As soon as the laying of the rail is started, every spike and every bolt should be removed from the rail that is being replaced, far enough in advance of the actual laying to insure that there will be no interference with or delay to the remaining operations which precede the laying of the new rail.

No foreman should allow the removal of the bolts and spikes to be carried too far in advance of the rail-laying unit, however, that is, beyond his next point of closure. He has, or should have, a dependable lineup of trains and should be able to make his closure with the track full bolted and full spiked every time he clears a train, as well as when he quits at noon and at night.

With modern power machines for backing the nuts off of the bolts, for pulling the spikes and for adzing the ties, there is no necessity for pulling the spikes from every alternate tie or for removing one-half of the bolts from the joints far in advance of the removal of the rail. Likewise it is not now necessary to throw out the old rail so far in advance of setting the new rail into the track as was formerly considered necessary to allow plenty of time for hand adzing, before these helpful machines were available. At that time it was difficult to perform these several parts of the preparatory work as rapidly as the new rail could be set into the track without assigning a large number of men to each of these tasks.

With power equipment to perform these tasks, it becomes unnecessary to strip the track partially at any time. It is only necessary to remove the spikes and bolts out of face far enough in advance to keep out of the way of the following operations which precede the setting of the rail into the track. Since these several jobs and the setting in of the rail are now performed so rapidly, whenever the stripping is stopped, it will require only a few minutes to complete the closure and make the track safe for the passage of trains.

Under modern conditions, therefore, the only limitation that need be placed on the advance work is that it shall not be carried beyond the point of closure for the passage of the next train or for the end of the period of work, either at noon or at night.

Must Be Protected

By J. P. Ensign
Assistant Division Engineer, New York Central, New York

Increased speeds of our main-line trains have brought demands for higher standards of maintenance and under such traffic the track should be fully bolted and fully spiked. Because these demands cannot always be fully met when laying rail if it is being laid in an operated track, a slow order should be placed in advance of the day's work, and before the track is opened in the morning temporary slow boards should be erected, showing the allowed speed. In addition to the slow board, a man with a yellow flag should place torpedoes in advance to give the engineman ample warning of the slow board as it is relocated every day with the progress of the gang.

After the slow order, which should not exceed 30 miles an hour, becomes effective, it will be safe to remove the spikes from every alternate tie. At least four bolts should remain in every joint until full use of the track is obtained. When the day's work is completed, either the slow order should remain in effect or the track should be fully bolted and fully spiked and the slow order raised until the following working day.

When a large gang is waiting to obtain full use of a track, the tendency is to turn in and strip as much track as the time will permit, the only limitation to the degree of stripping being determined by the foreman in charge. Obviously this will vary over a relatively wide range, depending on the foremen handling the various gangs. For this reason, the limitation outlined can be regarded as a workable rule to follow, and this limitation should be required of all foremen.

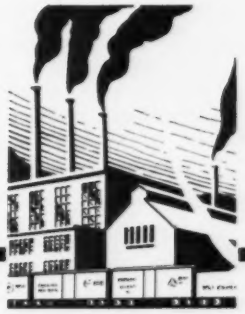
Track Must Be "Killed"

By J. B. Martin
General Inspector of Track, New York Central, Cleveland, Ohio

In the first place, no spikes or bolts should be removed until the track has been taken out of service. These fastenings form vital parts of the track structure and are used for definite and important purposes. The spikes hold the rails to the ties and maintain the gage of the rails; the bolts fasten the joint bars which support the rail ends and hold the rails in correct alinement, both vertically and horizontally, with each other. Because of the important functions which both of these devices perform, any track over which trains are being operated at normal speed should be full spiked and full bolted.

It occurs frequently, in cases of minor accidents, particularly of derailments, that spikes and bolts are cut off. Usually, however, enough of both remain to hold the track intact. The hazard of a serious accident might be greatly increased if the track were not full spiked and full bolted when the derailment took place. Much can be accomplished in advance of the rail-laying operation through adzing around spikes and doing any other work that will facilitate the pulling of the spikes.

New Products Of the Manufacturers



Portable Fumigator

A PORTABLE hydrocyanic acid gas generator for fumigating buildings or cars has been developed by the R. & H. Chemicals department of E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., which is said to be highly efficient and safe from the standpoint of operation. The new generator, which is a simple upright metal cylinder with suitable mixing chambers inside, is equipped with a gas discharge hose and nozzle, by means of which the gas can be interjected into any area from without, thereby protecting the operator against exposure to the poisonous fumes.

Operation of the Generator is Entirely From Without the Premise Being Fumigated.

In carrying out fumigation with the new unit, the premise to be fumigated is first made as air tight as possible in the usual way. The generator is then carried or wheeled into position alongside, and the gas outlet nozzle is inserted under a doorway or through some other suitable opening into the area to be treated.

The generator is charged with Cyanegg, (du Pont 96 per cent sodium cyanide) and with sulphuric acid and water according to directions, and goes into immediate automatic operation, producing hot HCN gas under slight pressure which passes into the area being fumigated. After fumigation has been completed, the spent charge is dumped, the generator is washed and cleaned, and is then available for another job. It is said that the fumigant employed is effective for the control of cockroaches, bed bugs, body lice, fleas, rats and mice and other rodents, and is particularly adapted for treating passenger cars, camp cars and bunk houses.

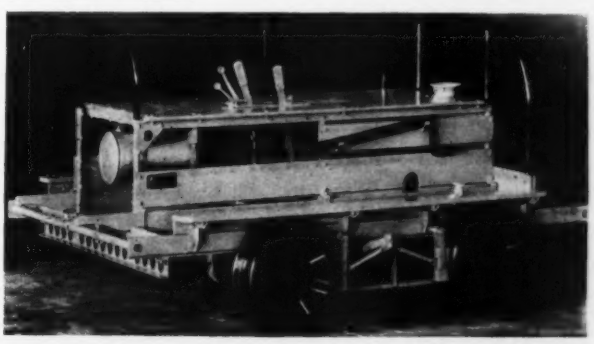
For convenience in fumigating areas of various sizes, the new generator is made in three capacities—No. 10, with a fumigating capacity up to 10,000 cu. ft.; and No. 25 and No. 100, with capacities for fumigating up to 25,000 and 100,000 cu. ft., respectively. Each pound of sodium cyanide used in the generators produces about 8 oz. of HCN gas, which is sufficient to fumigate 1,000 cu. ft. or more, depending upon conditions.

Fairmont One-Man Large Section Car

FAIRMONT Railway Motors, Fairmont, Minn., has introduced a new motor car, designated as S2 Series E, for use by "standard" section gangs of 8 or more men in the summer, which can be safely operated by one man. Using extension handles, which pull out at either end, the car has a lifting weight at the rear end of only 138 lb. The total weight of the car is 895 lb. and the net load capacity is 1,300 lb.

The new motor car is provided with a QBC engine which is identical with the QBA engine that is used in other Fairmont cars, except for the elimination of the sliding base through the use of the Timken bearing belt tension control. The car is said to be capable of towing two heavily-loaded trailers at a good speed up steep grades, the draw-bar pull being equal to that of other Fairmont cars having the QBA 8 to 13-hp. engine.

The seat of the car is 28 in. wide and 65⅜ in. long between the safety railings. All controls are closely grouped in the middle of the seat so that ample seat space is provided for eight men without obstructing the movements of the driver. Standard equipment for the new car includes $1\frac{5}{16}$ in.S.A.E. 1045 axles and 16-in. by ¼ in. demountable tires on 8-bolt aluminum hubs. Optional equipment includes 6-bolt 14-in. demountable wheels, which weigh 35 lb. less than the standard wheels, and $1\frac{7}{16}$ in. axles (with 16-in.



The New S2 Series E One-Man Large Section Car.

wheels) which, although they weigh only 10 lb., increase the capacity of the car to 1,800 lb.

Use of the Fairmont differential front axle eliminates the need for a loose wheel; consequently all four

One of the New Cars Equipped With Radial Transmission, Operating in a Test at an Altitude of 7,200 ft.

wheels are tight, being taper bored for three-piece insulation. All five axle bearings are double-row Timken units, each of which embraces a single long inner sleeve which is said to give better axle protection than two short inner races. The thrust collars are provided with an improved clamp and have no lugs.

The necessary frame strength is obtained with a minimum of weight through the use of high-tensile steel axle sills, aircraft-type cross channels, Haskelite Plymetl decks, ½-in. ash side boards, Masonite seat top, aluminum axle boxes, belt tension pulley, and steel-faced aluminum self-centering brake shoes.

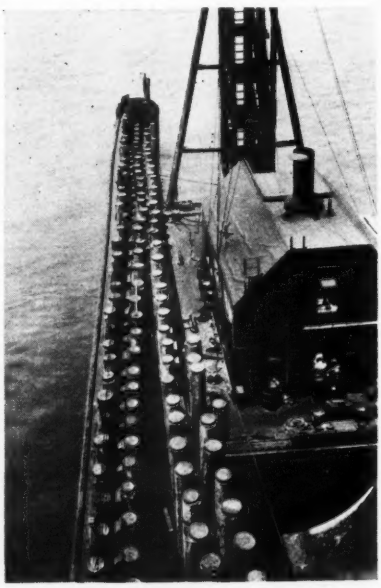
Each of the two tool trays is 68¼ in. long, 11⅛ in. wide and 12¾ in. deep in front, 6 in. at the outer side, and 3 in. in the rear. The lunch bucket rack is 34½ in. by 15 in. in dimensions. The battery and tool boxes are of steel and the former is provided with a "rubberseald" rain-proof cover. Running boards over the wheels provide safe footing when the tool trays are full.

New equipment available as extras with the S2 Series E car includes the Vortox air cleaner, a condenser built into the water jacket; radial two-speed transmission; radial countershaft for operation in deep snow, slush or high wet weeds; and an electric generator, a headlight, two red rear markers and a 24-hr. storage battery for ignition and lights.

An accompanying illustration shows one of the new cars operating with a heavy load at an altitude of 7,200 ft. This car is equipped with the optional radial two-speed transmission. In a test the car started a 7,285-lb. gross load on a 2.2 per cent grade and operated at a speed of 10 to 13 miles per hour in "low" gear over the steepest grade, which was 4.2 per cent. This radial transmission is a standard two-speed gearset bolted on a base at the deck level and is supported by two Timken bearings about the car axle. Thus the entire gearset is free to move forward or backward to loosen or tighten the endless cord drive belt. It permits the elimination of the Timken belt tension (third) pulley from the standard car, and the transfer of the axle pulley up to the two-speed transmission drive shaft.

Greenheart Timber Now Available

GENUINE greenheart timber and piling, a South American wood said to have unusual physical and structural qualities, is now being made available in this country in its largest sizes by the Greenheart Lumber Company, New York City, and has already been employed in a number of structures by several roads. This timber, grown in British Guiana, is a dense and tough hardwood, weighing approximately 70 lb. to the cubic foot. Tests have shown that it is more than twice as strong in bending as other types of timber commonly employed in construction, and several times as strong under compression, both parallel with and normal to the grain.



Ferry Racks Being Constructed at New York With Two Rows of Greenheart Piling

Supplementing this quality of strength, it is claimed that greenheart timber is highly resistant to abrasion, fire, decay and the attack of the various types of marine borers. Other advantages found in this timber are the large sizes in which it is available, and the fact that it grows with a very gradual taper. More specifically, it can be furnished in commercial sizes up to 16 in. by 16 in. by 40 ft., or as piling 75 to 80 ft. long, with a minimum tip diameter of 12 in. This latter feature, combined with the claimed natural resistance of the timber to decay and attack by marine borers, without treatment, has led a number of roads serving various Atlantic and Gulf seaports to employ it for bulkheads and for ferry racks. Through the greater mass, length and strength available in greenheart piles, these roads have found that equal or greater service requirements can be met with fewer piles than would be used ordinarily.

One road, because of the resistance of the timber to abrasion, has employed it in a heavy-traffic freight transfer platform, where it expects it to stand up two to three times as long as the planking used formerly. Incidentally, the greater strength of the greenheart lumber permitted wider spacing of the joists in the platform rebuilding operations, and the use of two-inch planking, whereas a double-course deck, five inches thick, was required formerly to meet strength requirements.

What Our Readers Think

Letter No. 100

Chicago

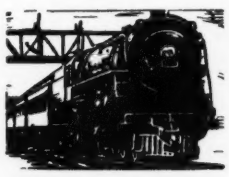
To the Editor:

I have just read No. 100 of your letters to the readers that appeared in your April issue.

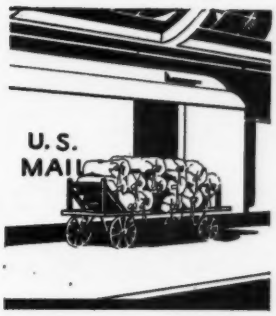
The first thing I read when a new issue of the magazine comes to my desk is your letter, as each one contains some new thought and suggestion. I know of many others who make it a point to read each letter.

You are to be congratulated on the series of letters and I trust that you will keep them up indefinitely.

Fred E. Weise
Chief Clerk,
Engineering Dept.,
Chicago, Milwaukee,
St. Paul & Pacific



News of the Month



Freight Claim Payments Show Increase in 1936

Loss and damage claims in 1936 cost the railroads a total of $20,920,487, according to reports to the Freight Claim division of the Association of American Railroads by 151 carriers, representing 95 per cent of the United States and Canadian mileage. This total represents an increase of $2,974,438, or 16.6 per cent, as compared with 1935, and of $3,886,456, or 22.8 per cent, as compared with 1934.

I.C.C. Celebrates Fiftieth Anniversary

The end of its first 50 years of existence was celebrated recently by the Interstate Commerce Commission by appropriate ceremonies. The occasion was marked by a banquet which was held at the Mayflower hotel, Washington, D.C., on March 31, with 800 guests in attendance, and by a full day of speeches on April 1, which were delivered before an assembly of the commission's staff and friends in the auditorium of the commission building.

Fatalities Among Trespassers Increase

During 1936 a total of 2,738 illegal train riders and other trespassers on railroad property lost their lives in accidents, a greater number than for any year, except one (1933), since 1923, and an increase of 26 as compared with 1935, according to statistics released by the Protective section of the Association of American Railroads. Accident studies made by the Protective Section show that approximately 50 per cent of the accidents to trespassers result fatally.

New Burlington Streamlined Locomotive

The first of two streamlined steam locomotives, in which reciprocating parts are designed to withstand high-speed operation, has just been completed by the Chicago, Burlington & Quincy in its shops at West Burlington, Iowa. After a series of road tests, this locomotive will be placed in regular service as a relief locomotive on the Zephyr runs between Chicago and Denver and Chicago and the Twin Cities, and in other high-speed passenger service. The locomotive and tender of the new unit are enclosed in stainless steel sheets in such a manner as to make them resemble the Zephyrs. It is a 4-6-4 type locomotive, burns coal and is capable of speeds of more than 100 miles an hour. The new locomotive has been christened the "Aeolus," a name taken from Greek mythology, which means "keeper of the wind."

Railroad Purchases Pass Billion in 1936

Purchases of the railroads of the United States in 1936 reached the billion dollar mark for the first time since 1930, according to figures compiled by the Railway Age. Based on reports from 98.5 per cent of the Class I lines and from numerous short lines and switching and terminal companies it was estimated that the purchases made by all the railroads of the country for materials and equipment in 1936 totaled $1,041,000,000. Of this amount $760,617,000 went for materials and equipment and $280,571,000 for fuel. The total purchases of the railroads last year exceed earlier estimates by $60,000,000 and puts the railway purchases for 1936 approximately $410,000,000, or 65 per cent, ahead of the corresponding purchases in 1935. That the greater activity in railroad buying is continuing into 1937 is indicated by figures for January, the latest month for which comprehensive data are available, which show that in that month the railroads spent $81,201,000 for materials (excluding fuel) and equipment, as compared with purchases of $37,779,000 in January, 1936, an increase of 115 per cent.

New Pension Tax Bill Introduced in House

A new railway pension tax bill carrying rates slightly higher than those provided for in the recent compromise agreement between the railroad managements and the 21 labor unions was introduced in the House of Representatives on April 15. The new bill is designed to overcome the objections of the United States Treasury to the compromise agreement, which were based on the belief that the proposed tax rates were not sufficient to produce the needed revenue. The bill provides for an income tax on employees and an excise tax on the carriers, the rate on each for 1937, 1938 and 1939 being 2¼ per cent; for 1940, 1941 and 1942, 3 per cent; for 1943, 1944 and 1945, 3¼ per cent; for 1946, 1947 and 1948, 3½ per cent; and thereafter 3¾ per cent. Under this scale the railroads and their employees would, during the first year, pay into the fund approximately $5,000,000 more than under the compromise agreement, but about $15,000,000 less each than under the original act. The bill provides for the return to the carriers and their employees of taxes collected during 1936 under the terms of the original pension tax act.

February Net In Further Gain

In February, the Class I railroads of the United States had a net railway operating income of $38,358,638, which was at the annual rate of return of 2.43 per cent on their property investment, as compared with $33,562,341, or 2.13 per cent for February, 1936, according to the Bureau of Railway Economics of the Association of American Railroads. Operating revenues for February this year amounted to $321,926,715, as compared with $300,430,323 for the corresponding month of last year, a gain of 7.2 per cent. Operating expenses totaled $244,146,474, as compared with $235,875,519.

Equipment on Order Reaches High Level

On April 1 the Class I railroads had 46,439 new freight cars on order, as compared with 13,362 cars on order on the same date last year, and 482 on April 1, 1935. In fact, the number of freight cars on order on April 1 was greater than for the corresponding date in any year since 1926, when 49,524 such cars were on order. Of the new freight cars on order on April 1 this year coal cars totaled 23,703; box cars, 17,404; refrigerator cars, 2,731; flat cars, 926; and stock cars, 1,300. On the same date the Class I carriers had 359 new steam locomotives on order, a larger number than for any year since 1930, when there were 442 on order.

Anticipate Increase in Second-Quarter Loadings

Freight car loadings in the second quarter of 1937 are expected to be about 7.5 per cent above actual loadings in the same quarter in 1936, according to estimates compiled by the 13 shippers' regional advisory boards. Increases in loadings are expected in all except the Mid-West region. On the basis of these estimates, freight car loadings of the 29 principal commodities will be 5,730,200 cars in the second quarter of this year, as compared with actual loadings of 5,331,496 cars for the same commodities in the second quarter of 1936. The largest percentage increase (39.4) is expected to take place in the Northwest region, while the smallest (2.2) is anticipated for the Central Western region. It is estimated that loadings in the Mid-West region will show a decrease of 2.9 per cent.

Personal Mention

General

T. P. Crymes, a road supervisor on the Illinois Central with headquarters at Greenwood, Miss., has been promoted to trainmaster with headquarters at Memphis, Tenn.

J. H. Nuelle, president of the New York, Ontario & Western and formerly chief engineer of this company, has resigned to become president of the Lehigh Coal & Navigation Company and the Lehigh & New England Railroad.

F. H. Cothran, formerly chief engineer of the Piedmont & Northern, has been elected president of this company and the Durham & Southern, with headquarters at Charlotte, N. C. Mr. Cothran entered railway service with the Seaboard Air Line as an engineer and later served as

F. H. Cothran

resident engineer of the South & Western (now Clinchfield), then with the Coal & Coke railway in West Virginia. Later he was locating engineer with the Carolina, Clinchfield & Ohio (now Clinchfield) during its period of organization and construction. In 1911 Mr. Cothran became locating engineer for the Piedmont & Northern and located a considerable part of the lines of that system, and during its construction he served as division engineer. He later became chief engineer of that company, giving up that position to go to the Saguenay region in Quebec, where, as vice-president and general manager of the Quebec Development Company, the Duke-Price Company and the Alma & Jonquiere railroad, he had charge of the construction projects of those three companies.

Walter J. Taft, who has been a member of the editorial staff of the Railway Age in New York for the past nine years, has been placed in charge of editorial matters in the Washington (D.C.) office of the Railway Age, *Railway Engineering and Maintenance* and other magazines published by the Simmons-Boardman Publishing Corporation. **John H. King,** who has for the past few months served as assistant in the Washington office under the late **Harold F. Lane,** will continue in that capacity.

Mr. Taft came to the Railway Age in April, 1928, having already had both railroad and newspaper experience. Born on July 29, 1902, at Glendale, R. I., he attended public school at Pascoag, R. I., and the LaSalle Academy at Providence. He received his A.B. degree from Providence college in 1924. In 1924-25 he was a reporter for the Providence Evening Tribune. In 1925-27 he attended the Harvard Business School, from which institution he was graduated in the latter year with the degree of Master of Business Administration. During the summer of 1926, Mr. Taft worked in the accounting office of the New York, New Haven & Hartford at Harlem River, N.Y., and from July to December, 1927, he was a clerk in the engineering department of the Bangor & Aroostook at Houlton, Me. From January to April, 1928, he was a statistician in the service of the Boston & Maine at Boston, which position he left to join the staff of Railway Age.

Engineering

W. C. Heidenthal, engineer maintenance of way of the New York, Ontario & Western, has been appointed chief engineer, with headquarters as before at Middletown, N.Y.

R. C. Arnold, chief clerk to the division engineer of the Chicago Great Western at St. Paul, Minn., has been appointed engineer of surveys with headquarters at Chicago, to succeed **F. U. Mayhew,** who has resigned.

S. O. Kretsinger, assistant engineer on the Chicago & North Western with headquarters at Green Bay, Wis., has been appointed acting division engineer of the Lake Shore division with the same headquarters, pending the return of **J. A. Dyer,** who is on a leave of absence because of illness.

W. J. Hedley has been appointed construction engineer of the Wabash, with headquarters at St. Louis, Mo. **W. E. Gardner,** office engineer at St. Louis, has been appointed to the newly-created position of principal assistant engineer with the same headquarters, and the position of office engineer has been abolished. **R. L. Longshore,** drainage engineer, has been appointed general maintenance inspector with headquarters as before at St. Louis, and the position of drainage engineer has been abolished.

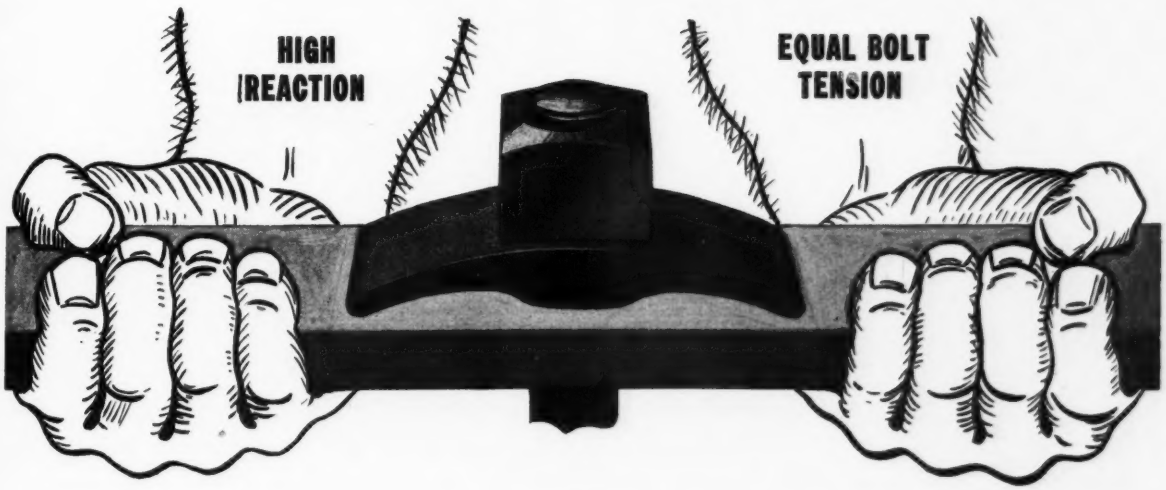
Robert H. Ford, assistant chief engineer of the Chicago, Rock Island & Pacific, has been appointed chief engineer, effective April 1, with headquarters as before at Chicago to succeed **W. H. Petersen,** who has retired with the title of consulting engineer. During approximately forty-five years of railroad service Mr. Ford has held important engineering positions with a number of railroads. He has been a student of the broader aspects of transportation engineering and has also been active in civic and educational matters. He was born on September 8, 1869, at St. Albans, Vt., and was educated at Norwich university, Northfield, Vt., graduating in 1892. He entered railroad service in the same year with the Central Vermont, with which road he served for 13 years on construction and maintenance as a roadmaster and in other capacities. In 1906, Mr. Ford left this company to go with the Missouri Pacific as an assistant engineer, later being appointed maintenance of way inspector. In 1907 he was promoted to principal assistant engineer and in 1909 he was further advanced to assistant to chief engineer maintenance of way. Resign-

Robert H. Ford

ing from the Missouri Pacific in 1911, Mr. Ford joined the Hodges-Downey Construction Company, Birmingham, Ala., general contractors, as chief engineer. In 1913 he left this company to go with the Rock Island as a special engineer, being appointed engineer track elevation in the following year. In 1919 Mr. Ford was promoted to principal assistant engineer and in 1924 he was further advanced to assistant chief engineer, the position he was holding at the time of his recent appointment as chief engineer. Mr. Ford has been active in the affairs of the American Railway Engineering Association, having served as president of the A.R.E.A., and chairman of the Engineering division of the Association of American Railroads, in 1935-36. At present he is chairman of the Special Committee on Engineering Research-Inland Waterways and Flood Control of the A.A.R. and retired this year as chairman of the Committee on Engineering Education of the American Society of Civil Engineers. During its entire period of existence he was also chairman of the A.R.E.A. Committee on Co-operative Relations with Universities and Colleges of the United States and Canada. In addition, he is a member of the A.A.R. Advisory Committee on Highway Grade Crossing Matters, and is a trustee of Norwich University.

Mr. Petersen has a record of 48 years of continuous railroad service in engineering capacities. He was born in 1867 at Appleton, Wis., and was educated at the University of Wisconsin, where he graduated in 1889. He entered railway service in June, 1889, as a rodman on the Chicago & North Western, and from March, 1890, to November, 1891, was instrumentman and resident engineer on lines which are now parts of the Northern Pacific and the

A TWO-FISTED DEVICE



Verona *Fixed Tension* Triflex Spring

The VERONA *Fixed Tension* Triflex Spring is a calibrated leaf spring for track bolts whose high reaction (over 2½ times the A.R.E.A. specifications) compensates for any looseness developed from wear while retaining at all times equal bolt tension throughout the joint.

SINCE 1873

WOODINGS–VERONA
TOOL WORKS VERONA, PA.

SINCE 1873

Great Northern. He returned to the North Western as instrumentman in March, 1892, and in May, 1893, was appointed assistant engineer on the Fremont, Elkhorn & Missouri Valley (now a part of the North Western) and later was promoted to general foreman of bridges and buildings at Fremont, Neb. He entered the service of the Union Pacific in June, 1898, where he was successively supervisor of bridges and buildings and division engineer at Cheyenne, Wyo., and assistant superintendent at Cheyenne and Ellis, Kan. Mr. Petersen was appointed bridge engineer of the Rock Island, with headquarters at Chicago, in 1906, and three years later was promoted to principal assistant engineer, with headquarters in the same city. In 1911 he was promoted to engineer maintenance of way of the First district, with headquarters at Des Moines, Iowa, and on January 1, 1929, he was further promoted to chief engineer.

W. H. Petersen

A. F. Maischaider, engineering assistant to the general manager of the Cleveland, Cincinnati, Chicago & St. Louis, (Big Four) has been appointed principal assistant engineer to succeed **O. E. Selby,** who has retired. Mr. Maischaider has been connected with this company for nearly 35 years. He was born on October 6, 1882, at Chicago and received his technical education at Purdue University, graduating in 1902. In June of the same year, Mr. Maischaider entered railway service with the Big Four as an assistant engineer on construction. Two months later he was appointed resident engineer on construction and in November, 1907, he was advanced to assistant division engineer. Five years later Mr. Maischaider was further promoted to division engineer and in May, 1924, he was made engineering assistant to the general manager, which position he held until his recent appointment as principal assistant engineer.

Edward L. Haley, whose appointment as division engineer of the Casper division of the Chicago, Burlington & Quincy, was noted in the March issue, was born on February 13, 1886, at Buffalo, N.Y. Mr. Haley received his education in civil engineering through a correspondence course. He entered railway service in June, 1905, with the New York Central & Hudson River (now part of the New York Central) serving as a chainman, rodman, instrumentman and assistant engineer in the construction department at Buffalo. In June, 1916, he left this company to enter industrial construction work, serving first with the Austin Company, Cleveland, Ohio, as a field engineer and estimator at the Curtiss Aircraft plant, Buffalo. From January, 1917, to December, 1918, he was with the Aberthaw Construction Company, Boston, Mass., as chief engineer of the construction of the plants of the Bethlehem Steel Company at Buffalo, N.Y., and Sparrows Point, Md. He first entered the service of the Burlington in July, 1919, as an instrumentman on maintenance and construction on the McCook division. His appointment as division engineer became effective on February 1.

Spencer R. Sproles, whose appointment as principal assistant engineer of the Gulf, Mobile & Northern, with headquarters at Mobile, Ala., was reported in the April issue, was born on July 25, 1897, at Tchula, Miss. Mr. Sproles was educated at the Mississippi Agricultural & Mechanical College, from which he graduated with a bachelor of science degree in civil engineering in 1919. He entered railway service on June 1, 1919, as a draftsman with the Gulf, Mobile & Northern. In May, 1921, he was advanced to assistant division engineer at New Albany, Miss., being appointed office engineer at Laurel, Miss., in July, 1923. A year later he was appointed assistant engineer with the same headquarters, and in April, 1925, he left the G. M. & N. to go with the Atlantic Coast Line as a resident engineer. After slightly more than a year in the latter capacity, Mr. Sproles returned to the G. M. & N. as engineer of construction. In April, 1928, Mr. Sproles was sent to Mobile, Ala., as construction engineer, being appointed track supervisor with the same headquarters in July, 1932. He was holding this position at the time of recent appointment as principal assistant engineer.

C. F. Sturdevant, who has been appointed division engineer on the Chicago, Burlington & Quincy, with headquarters at Alliance, Neb., as reported in the April issue, has served in the maintenance and engineering departments of this company for nearly 27 years. He was born on September 27, 1888, at Weston, Neb., and received his higher education at the University of Nebraska. He entered the service of the Burlington on October 1, 1910, as an axeman on construction at Wolton, Wyo. In January, 1911, he was sent to the Alliance division as a rodman on maintenance, holding this position until January, 1912, when he was made a draftsman at Lincoln, Neb. Two years later, Mr. Sturdevant was appointed an instrumentman on maintenance on the Omaha division, holding this position until February, 1915, when he was promoted to division engineer on construction at Guernsey, Wyo. In April, 1916, he returned to maintenance work as division engineer of the Lincoln division, being transferred to the Sterling division in May, 1932. In November, 1932, Mr. Sturdevant returned to the position of instrumentman, serving in this capacity on maintenance, construction and location until his recent promotion to division engineer.

Track

Claude Hardwick has been appointed roadmaster on the Chicago, Rock Island & Pacific with headquarters at Fairbury, Neb., to succeed **C. Kelley,** who has retired.

D. T. Hester, a track foreman on the Illinois Central, has been appointed supervisor with headquarters at Tutwiler, Miss., to succeed **J. W. Fowler,** who has been transferred to Greenwood, Miss., to replace **T. P. Crymes,** who has been appointed trainmaster, as noted elsewhere in these columns. These appointments became effective on April 1.

C. O. Enlow, a section foreman on the Atchison, Topeka & Santa Fe, has been appointed acting roadmaster on the First district of the Pecos division, with headquarters at Clovis, N.M., to succeed **J. E. Emond,** who has been appointed general foreman in the track department, with headquarters at Amarillo, Tex.

Henry M. Gully, resident engineer of the Gulf, Mobile & Northern, who has been appointed roadmaster, with headquarters at Union, Miss., as reported in the April issue, has been connected with the G. M. & N. for about twelve years. He was born on December 5, 1901, at Macon, Miss., and was educated at Mississippi State College, graduating in June, 1924. In May, 1925, he entered the service of the Gulf, Mobile & Northern as an instrumentman, holding this position until 1927, when he was promoted to resident engineer at Union.

C. L. Flinn, a track supervisor on the Beardstown division of the Chicago, Burlington & Quincy, has been promoted to roadmaster with headquarters at Beardstown, Ill., to succeed **E. C. Goehrig,** who has been transferred to Galesburg, Ill., where he replaces **C. H. Freed,** who has been transferred to Aurora, Ill. Mr. Freed replaces **J. Emerson,** who has been transferred with the same headquarters to succeed **Patrick H. Burke,** who has retired on pension after 55 years service with this company. **L. P. Carlson,** a supervisor on the LaCrosse division, has been promoted to roadmaster with headquarters at North LaCrosse, Wis., to replace **J. P. Malay,** who has been transferred with the same headquarters, to replace **J. DeBord,** who has been assigned to other duties.

L. L. Harding, assistant supervisor of track on the Maryland division of the Pennsylvania, has been transferred to Shire Oaks, Pa. **G. A. Royce,** assistant supervisor, with headquarters at Olean, Pa., has been transferred to the Middle division, with headquarters at Newport, Pa. **H. J. Lattomus,** assistant supervisor, with headquarters at Harrisburg, Pa., has been transferred to Dennison, Ohio, and **M. B. Jamin** has been appointed assistant supervisor on the Philadelphia division, at Harrisburg. **J. H. Goas,** has been appointed assistant supervisor on the Williamsport division, with headquarters at Lock Haven, Pa.

Orin Stewart, an extra gang foreman on the Illinois Central, who has been promoted to supervisor of track, with head-

80 Railroads Can't Be Wrong!

Boston & Albany
Alabama Great Southern
Boston & Maine
Santa Fe
Atlantic Coast Line
Baltimore & Ohio
Bingham & Garfield
Central Vermont
Chicago & Eastern
Chicago & Illinois
Chesapeake & Ohio
Chicago & North Western
Chicago, Burlington & Quincy
Elgin, Joliet & Eastern
Chicago & Western Indiana
Chicago, Indpls. & Louisville
Chicago, Milwaukee, St. Paul & Pacific
Chicago, Rock Island & Pacific
Chicago, St. Paul, Mpls. & Omaha
Great Northern
Delaware & Hudson
Denver & Rio Grande Western
Ft. Worth & Denver City
Grand Trunk Western
Illinois Central
Indianapolis Union
Kansas City Southern
Lehigh & New England
Louisiana & Arkansas
Lehigh Valley
Louisville & Nashville
Maine Central
Michigan Central
Missouri-Kansas-Texas
Monongahela
New York Central
New York, Chicago & St. Louis
New York, New Haven & Hartford
Norfolk & Western
Northern Pacific
Pennsylvania
Pittsburgh & Lake Erie
Reading
Pere Marquette
Peoria & Western
Toledo Terminal
Western Maryland
Peoria & Pekin Union
Panhandle & Santa Fe
Gulf, Colorado & Santa Fe
Big Four
Oregon Short Line
Chicago Great Western
Del., Lackawanna & Western
Canadian National
Wheeling & Lake Erie
Western Pacific
Union Pacific
Wabash Railway
Erie
Toronto, Hamilton & Buffalo
Union Railroad
Missouri Pacific
Southern
St. Louis—Southwestern
Seaboard Air Line
Southern Pacific
Buffalo
Richmond, Fredericksburg & Potomac
St. Louis—San Francisco
Minneapolis, St. Paul & S. S. Marie

These Tools take the guess-work out of Maintenance

ADZING MACHINE . . SPIKE PULLER . . POWER JACK . . RAIL DRILL
THREE GRINDERS . . POWER WRENCH . . TRACK SHIFTER

NORDBERG MFG. CO. MILWAUKEE WISCONSIN

quarters at Reevesville, Ill., as reported in the April issue, was born on September 3, 1890, at Whitehall, Ill. He entered railway service with the Illinois Central on April 15, 1911, as a timekeeper and assistant foreman on the Springfield division. On December 1, 1911, Mr. Stewart was promoted to section foreman, and on April 1, 1916, he was further advanced to yard foreman at Springfield, Ill. In 1922 he was assigned to the position of track inspector at Clinton, Ill., and in the following year he was loaned to the Walsh Construction Company, being located at Monee, Ill., during his period of service with this company. Later in 1923 Mr. Stewart returned to the Illinois Central as an extra gang foreman on the Illinois division, which position he held until his recent promotion to supervisor of track.

Bomar O. Webb, terminal foreman on the Nashville, Chattanooga & St. Louis at Memphis, Tenn., whose promotion to supervisor of track was reported in the April issue, has been connected with this company continuously for 21 years. He was born on September 25, 1897, at Martin, Tenn., and received his education at Hall Moody Institute and through the International Correspondence Schools. He entered railway service with the Nashville, Chattanooga & St. Louis on July 16, 1916, and two years later he was advanced to assistant track foreman. In November, 1920, Mr. Webb became an extra maintenance foreman, and on March 1, 1922, he became a floating gang foreman. Five months later Mr. Webb was assigned to the position of terminal foreman at Memphis, where he remained until his recent promotion to supervisor of track at Bruceton, Tenn.

Mason Rector, who has been appointed roadmaster on the Chicago, Rock Island & Pacific, with headquarters at El Reno, Okla., as reported in the April issue, has been identified with this company for nearly 17 years. He was born on October 7, 1900, at Lincoln, Neb., and was educated at the University of Kansas, graduating in 1920. He entered railway service on June 1 of the same year with the Rock Island as a freight trucker at El Reno, Okla. Two months later he was transferred to the engineering department, where he served as a chainman, rodman, section laborer, sanitary foreman, masonry inspector, junior instrumentman, assistant engineer and assistant construction engineer until August 1, 1936, when he was appointed acting division engineer at El Reno. On November 1 of the same year he returned to the position of assistant engineer at El Reno, which he held until January 1, 1937, when he was appointed acting roadmaster at Haileyville, Okla. His appointment as roadmaster at El Reno became effective on March 22.

Bridge and Building

D. C. D. Todd had been appointed assistant master carpenter on the Philadelphia Terminal division of the Pennsylvania, and **D. E. Wiltse** has been appointed assistant master carpenter on the Baltimore and Maryland divisions.

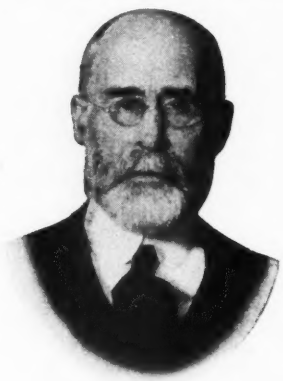
T. M. Von Sprecken, assistant engineer for the Southern at Washington, D.C., has been appointed assistant bridge and building supervisor on the Alabama Great Southern (part of the Southern system), with headquarters at Birmingham, Ala.

J. W. Rowland, who had been connected with the office of the engineer of bridges and buildings of the Pennsylvania, Eastern Region, has been appointed master carpenter of the Toledo division, with headquarters at Toledo, Ohio, to succeed **W. B. Radbone,** deceased.

Milton H. Ferry, who has been appointed master carpenter of the Mahoning division of the Erie, with headquarters at Youngstown, Ohio, as noted in the April issue, was born on March 25, 1894, at Hornell, N.Y. Mr. Ferry studied concrete engineering through the International Correspondence Schools and later took a course in supervision under the Railway Educational Bureau. He entered railway service on July 1, 1911, with the Pittsburgh, Shawmutt & Northern, remaining with this company until April, 1917, when he entered the United States army. After his discharge in 1919, Mr. Ferry returned to the P. S. & N., serving in the transportation department until November, 1926, when he went with the Erie as a carpenter helper. Since then, Mr. Ferry has served successively in the positions of carpenter, bridge inspector, scale and weighing inspector, and assistant master carpenter, his most recent promotion being to the position of master carpenter.

Obituary

H. R. Talcott, assistant chief engineer of the Baltimore & Ohio, with headquarters at Baltimore, Md., died on April 6 at his



H. R. Talcott

home in Washington, D.C. Mr. Talcott was born at Richmond, Va., on November 9, 1861, and entered the service of the Chesapeake & Ohio in October, 1879, in the engineering department. From 1881 to August, 1884, he was engaged in engineering successively on the Western of North Carolina (now Atlantic Coast Line), the United States Fish Commission, the United States Coast & Geodetic Survey, and the Richmond, Fredericksburg & Potomac. From August, 1884, to July, 1892, he was engaged in construction work on the Baltimore & Ohio and other companies. In March, 1894, Mr. Talcott became vice-president of the Seattle Coal & Iron Company, then serving as agent for the receiver of this company until December, 1897, and simultaneously from April, 1894, to June, 1897, as chief engineer of the Seattle Lake Shore & Eastern (Northern Pacific). He then served until March, 1903, as chief engineer of the Seattle & International (Northern Pacific); assistant in charge of construction from Skagway, Alaska, to Lake Bennett, B.C., of the White Pass & Yukon; resident engineer of the Seattle division of the Northern Pacific; treasurer of the Taft-Pierce Manufacturing Co. of Woonsocket, R. I. Mr. Talcott became assistant engineer in charge of survey and location of the Baltimore & Ohio, in March, 1903, being promoted to engineer of survey in March, 1905. On June 15, 1917, he was advanced to assistant chief engineer, the position he held until his death.

Association News

Roadmasters Association

The proceedings of the convention held in Chicago last September, containing the reports, papers, addresses and discussions presented at that meeting, are ready for mailing and will be in the hands of the members early in May.

Bridge and Building Association

Copies of the proceedings of the association for 1936 will be mailed to the members early in May. These proceedings contain the reports, papers and addresses as well as the discussions presented from the floor at the convention last October.

Metropolitan Track Supervisors Club

Seventy members and guests of the club, on Thursday, April 22, heard Robert Faries, assistant chief engineer, maintenance, of the Pennsylvania, discuss the Maintenance of Track for High Speed Service. The meeting, held at the Hotel McAlpin, New York City, was preceded by dinner at 6:30 p.m. Mr. Faries based his remarks largely upon the experience of his road with high-speed operation over the newly electrified territory between New York and Washington, D.C., pointing out the many tests conducted and changes made in the track structure to insure safety and the greatest comfort in travel, while at the same time minimizing yearly track maintenance costs.

Maintenance of Way Club of Chicago

The sixteenth annual meeting of the club was held on April 26, when T. J. O'Shaughnessy, supervisor of personnel, Rock Island Lines, presented a paper on current menaces to the well-being of the railroads, to 77 members and guests. The following were elected officers of the club for the ensuing year: President, W. G.

Internal Rail Joint Lubrication

Packing rail joints with Plastic Metal Preserving Lubricant eliminates corrosion and reduces wear on fishing surfaces.

Free longitudinal movement of rail in a tight joint is necessary for the maintenance of good alignment. A packed joint will not freeze regardless of how tight bolts are pulled up.

Joints can be permanently protected at a low cost without removing splices, at the rate of 150 to 200 joints per hour.

RAILWAY MAINTENANCE CORPORATION

Pittsburgh, Pa.

Arn, assistant engineer, Illinois Central; first vice-president, A. B. Hillman, roadmaster, Belt Railway of Chicago; second vice-president, G. M. O'Rourke, district engineer, Illinois Central; secretary-treasurer; W. S. Lacher, managing editor, *Railway Engineering and Maintenance* .(re-elected). Members of the Executive Committee elected to serve for two years are: A. H. Peterson, roadmaster, Chicago, Milwaukee, St. Paul & Pacific; P. F. Maisenbacher, roadmaster, Elgin, Joliet & Eastern, Gary, Ind., and George F. Killmer, sales engineer, Morden Frog & Crossing Works.

American Railway Engineering Association

Two committees held meetings in April, and to date five have meetings scheduled for May. The Committee on Economics of Railway Operation met at Chicago on April 22 and the Committee on Water Service, Sanitation and Fire Protection at the same place on April 30. On May 4 the Committee on Shops and Locomotive Terminals will meet at Chicago, to be followed on May 5 and 6 by the Committee on Buildings. The Committee on Economics of Railway Labor will meet at Kansas City, Mo., on May 11 and 12, and the Committee on Ballast, at Washington, D.C., on May 17, while the Committee on Iron and Steel Structures will hold its meeting at Pittsburgh, Pa., on May 6 and 7. The personnel of committees and the outline of work for the committees have been agreed upon and the secretary's office is now engaged in preparing the bulletin containing the committee personnel and assignment of work, which will be mailed to the committee members early in May.

Therm-O-Tile—The various steps in the installation of a Therm-O-Tile steam conduit system are described and illustrated in a pamphlet which was recently issued by H. W. Porter & Company, Inc., Newark, N.J.

Johns-Manville Industrial Products—A 62-page profusely illustrated catalog has been published by the Johns-Manville Corporation, New York, in which are described and illustrated the various industrial products of this company, including roofing and siding materials, insulation materials, refractory cement, flooring materials, welded wire reinforcement, and Transite asbestos pipe.

Brunorized Rails—A 20-page attractively printed and illustrated booklet bearing this title has been published by the Carnegie-Illinois Steel Corporation, Pittsburgh, Pa. First pointing out how recent developments in railroad transportation have brought about a need for better rails, the bulletin then discusses the problems presented by rail breakage and end batter; describes the Brunorizing process, including the controlled end-hardening which is involved; and explains the changes that are brought about in the physical properties of the rail metal. The results of 32 service tests on 23 railroads are also given in the booklet.

Supply Trade News

General

The Linde Air Products Company, a unit of the Union Carbide & Carbon Corporation, has opened a new oxygen plant on Powhattan avenue, Essington, Pa., near Philadelphia. The oxygen requirements within the city limits of Philadelphia will be served, as formerly, by the Linde branch at Eighteenth and Cambria streets, and the additional facilities will take care of the needs of the surrounding area.

Personal

George F. H. Hicks, president of the Harris Track Laying Company, died at Chicago on March 23 of a heart attack.

Charles Abeles has joined the sales organization of the **Easton Car & Construction Company,** Easton, Pa., and will have headquarters at New York. Mr. Abeles was formerly with the Koppel Industrial Car & Equipment Company as assistant sales manager in charge of the Eastern district.

W. J. Montgomery of the **Sherwin-Williams Company,** Cleveland, Ohio, has been appointed general manager of transportation sales for this company. Mr. Montgomery, who succeeded **K. H. Wood,** now vice-president and general sales manager for the company, has for some years served as assistant manager of transportation sales.

Roland W. Burt has been appointed eastern manager of railroad sales for **Joseph T. Ryerson & Son, Inc.,** with

Roland W. Burt

headquarters at the Jersey City, N. J., office of the company. Mr. Burt has been with the Ryerson company for 14 years, advancing through its various sales divisions to the position of sales representative in the state of Indiana. Later Mr. Burt took charge of railroad sales at St. Louis, Mo.

The Timken Roller Bearing Company, Canton Ohio, has appointed district managers in charge of steel sales for its Steel and Tube Division as follows: **W. F. Anderson,** St. Louis, Mo.; **M. C. Bellamy,** Seattle, Wash.; **G. W. Curtis,** Milwaukee, Wis.; **H. V. Fleming,** Birmingham, Ala.; **B. E. Keifer,** Cincinnati, Ohio; **H. D. Robb,** Pittsburgh, Pa., and **B. M. Tinlin,** Huntington, W. V..

C. M. Burpee, research engineer of the Delaware & Hudson, has been elected vice-president of the railroad division of the **Chipman Chemical Company,** Bound Brook, N. J., with headquarters at Chicago.

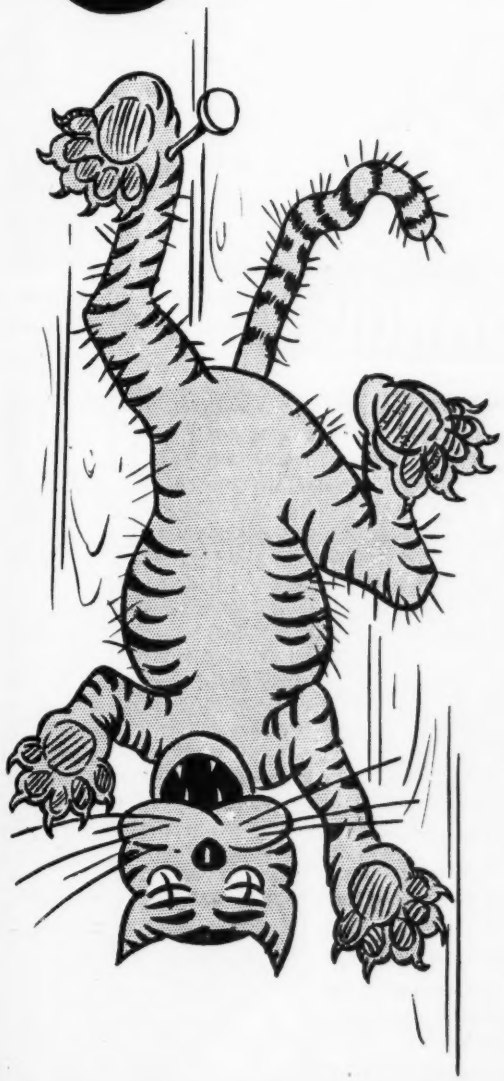
C. M. Burpee

Mr. Burpee was born at Edmunston, N. B., on August 18, 1900, and graduated from the University of New Brunswick in 1923. His first railway experience was gained during the summers of 1918 to 1920, when he was employed in the maintenance of way department of the Canadian National as assistant building inspector, ballast pit clerk, rodman and instrumentman. During the summers of 1921 to 1923 he was employed by the department of public works of the Province of New Brunswick as resident engineer on highway construction. In the following year he was associated with Marquette university, Milwaukee, Wis., as instructor of surveying, descriptive geometry and drawing. On July 1, 1924, he entered the employ of the Delaware & Hudson as bridge and building supervisor on the Pennsylvania division, and later served in the same capacity and as track supervisor of the Susquehanna division. In 1928 he was appointed bridge and building master of the Saratoga division, which position he held until April, 1930, when he was appointed purchasing engineer. He held the latter position until May, 1933, when he was promoted to research engineer, his duties consisting of the application of research in connection with the purchase and use of materials as well as the purchase and supervision of inspection of all forest products. He has been active in the Purchases and Stores division of the Association of American Railroads, and the American Railway Bridge and Building Assn., of which he is first vice-president.

Power Pumps—Fairbanks, Morse & Company, Chicago, has published an illustrated folder, designated as Bulletin 6165, in which are described its duplex, self-oiling pumps for handling mud and slush, clear water, petroleum products and other liquids.

THERE ARE MANY WAYS TO "Skin a Cat"

TO RAILWAY SUPPLY MANUFACTURERS



THERE ARE ALSO MANY WAYS TO SPEND THE MAINTENANCE DOLLARS that heavier traffic is making available in increasing numbers.

More work equipment, better drainage, heavier rail, building repair and painting, fencing—and a host of other demands are clamoring for consideration.

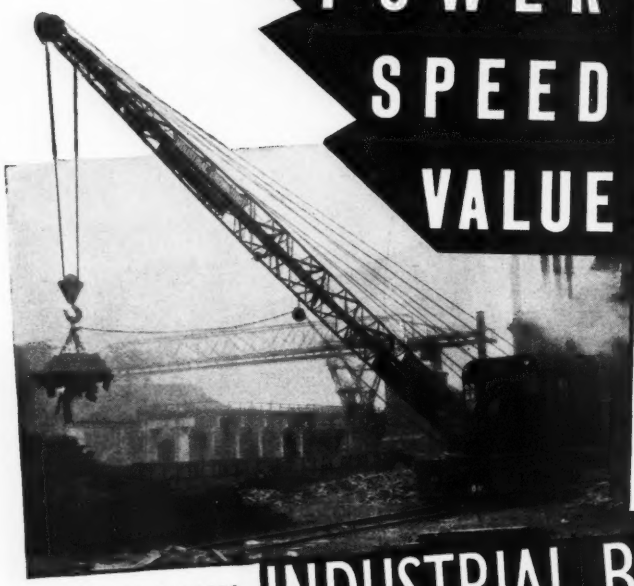
Maintenance officers of subdivision, division and system rank alike are confronted with the problem of selection.

Are *you* telling to these men the story of *your* products and of the economies they will effect?

Are you including as an essential part of your 1937 sales program representation for your products in the magazine which these maintenance men read first of all?

RAILWAY ENGINEERING AND MAINTENANCE IS READ BY MAINTENANCE OFFICERS OF ALL RANKS

ECONOMY POWER SPEED VALUE



With an Industrial Brownhoist Diesel there is no delay for getting up steam or to take on water; no need for a fireman. Productive working hours are increased; fuel costs are considerably lower.

Not merely engine horsepower, but sustained power, properly applied through quiet, worm or helical gear reducers, running in oil and equipped with anti-friction bearings. Industrial Brownhoist Diesels are quiet running and easy to operate.

Speed to spare — for all kinds of bucket, hook and magnet service and for travel up to 15 miles per hour. Variable travel speeds are provided.

Industrial Brownhoist Diesels usually show savings of from 25% to 50% depending, of course, on the costs of fuel and the class of work. The value of one of these cranes to you can be determined easily by checking with your present handling costs. Capacities range from 20 to 50 tons.

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INDUSTRIAL BROWNHOIST

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BETTER ROOF PROTECTION and LONGER SERVICE with Mule-Hide 5" Safety Lap Roll Roofing

All nail heads are covered - no exposed nails.
Makes a solid one piece roof, firmly welded together.
Eliminates expensive maintenance costs.
No need for re-nailing loose seams, patching or repairs caused by exposed nails that have rusted, broken off, or pulled out.

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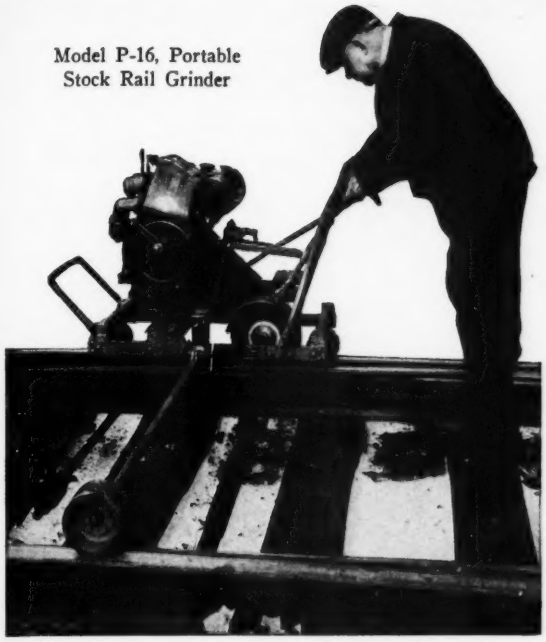
TESTED AND PROVEN BY MANY OF THE LEADING RAILROADS OF THE COUNTRY

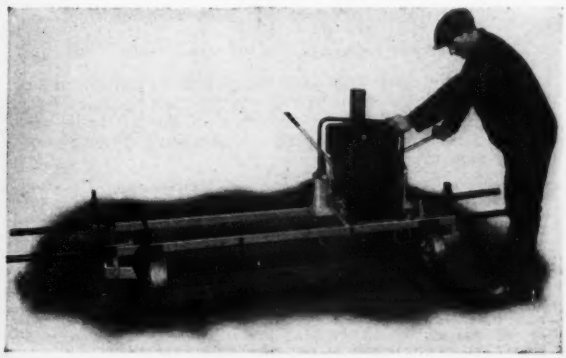
ASPHALT THE LEHON COMPANY ASBESTOS
MULE-HIDE ROOFS
44th to 45th St. on So. Oakley Ave. Chicago, Illinois

Model P-16, Portable Stock Rail Grinder



How About Comfort?

Even a modern streamlined, air conditioned train fails to deliver a smooth, swift, safe and silent ride on corrugated rail, battered joints, worn switches, frogs and crossings. Smooth your track. Weld and grind the joints. Grind out corrugations. Do the work economically with Railway Track-work Grinders. Many models are available to meet any service requirement. See the data bulletins. Copies mailed on request.



Model P-11, Rail Joint Cross Grinder
A portable cross grinder for removing overflowed metal from rail ends and slotting closed and welded joints. This machine, owing to certain mechanical features, attains high production, accuracy, efficiency and economy.

Railway Track-work Co.
3132-48 East Thompson St., Philadelphia

WORLD'S HEADQUARTERS FOR TRACK GRINDERS

7241

with WILLIAMS' "SUPERECTOR"

Railroad men everywhere are fast adopting Williams' new "SUPERECTOR"—the wrench that has everything. It's popular on bridge and building construction—speeds up track work—saves time, yet cuts accident hazards on every job.

The "SUPERECTOR" has "extras" a-plenty: extra strength and power, with *Quadruple* pawls instead of the usual two—extra speed and safety, with instantly reversible ratchet design and a sure-gripping socket. The *drop-forged* handle makes the "SUPERECTOR" unbelievably strong yet comparatively light in weight—easy to handle, yet big and powerful enough to turn just about anything with threads on it.

Five Sizes—24 to 53"—for both Hex and Square sockets, 1 to 4-5/8" openings.

Fully Guaranteed.

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Headquarters for: Drop-Forged Wrenches (Carbon and Alloy), Detachable Socket Wrenches, "C" Clamps, Lathe Dogs, Tool Holders, Eye Bolts, Hoist Hooks, Thumb Nuts and Screws, Chain Pipe Tongs and Vises, etc., etc.

WILLIAMS
SUPERIOR DROP-FORGED TOOLS
"SUPERECTOR"

Everywhere along the line

DOWN ON THE TIES—UP IN THE AIR

PORTER CUTTERS

PROMOTE *Efficient* MAINTENANCE

On the signal system of any railroad — on the return circuit, third rail, catenary structure and transmission towers of electrified railroads — in the repair shops of every railroad — Porter Cutters are whole minutes *faster* and very much *easier*, than any other way of cutting "on the job". Unequalled for cutting bolts, wires, bonds, cables, rivets, or removing deformed or "frozen" nuts.

There is a Porter tool for every cutting requirement up to annealed bolts in the thread ¾"; soft steel rods, ⅝"; hardened chain, ½".

Ask your supply house about Porter Cutters, or write us for descriptive literature.

H. K. PORTER, Inc.

EVERETT, MASS.

BOOKS THAT HELP MAINTENANCE MEN

Track and Turnout Engineering

By C. M. KURTZ

Engineer, Southern Pacific Company

This new handbook for location, construction and maintenance of way engineers, transitmen and draftsmen, gives practical mathematical treatment of track layout and other problems. These are fully exemplified and worked out in detail, and illustrated with drawings of accepted designs for fixtures and track layouts. It contains original as well as a complete set of standard railway engineering handbook tables. All computing problems which may arise in track engineering are thoroughly treated.

457 pages, 116 illustrations, 33 tables, flexible binding, 5x7, $5.00

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A new book giving expert information on the design, fabrication and installation of standard railroad trackwork. Thoroughly describes switch stands, switches, frogs, crossings and slip switches.

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Packed full of practical information written on a background of 25 years experience. The meat of modern maintenance practice is in this book. It is the most complete work on the subject.

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This little book has practically revolutionized curve and switch calculation practice since its appearance 12 years ago. The proved accuracy of its methods has caused them to be adopted as standard practice on many roads.

Complex algebraic and geometric calculations are reduced to their simplest form and as nearly as possible to terms of simple arithmetic. Application of these calculations to the actual job is made plain by brief explanations. Drawings further clarify the subject and make the meaning of the text unmistakable. Tables of dimensions are a further help to the track foreman.

Short cut formulae are featured. String lining and tape line layouts are fully explained. While retaining practically all of the rules and principles which have been tested in previous editions, changes have been made in several detailed features to correspond to improved designs. A flexible binding makes the new edition more convenient to slip in the pocket and carry on the job.

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Please send me for 10 days' free examination the books checked below. I will either remit list price or return the books within that time.

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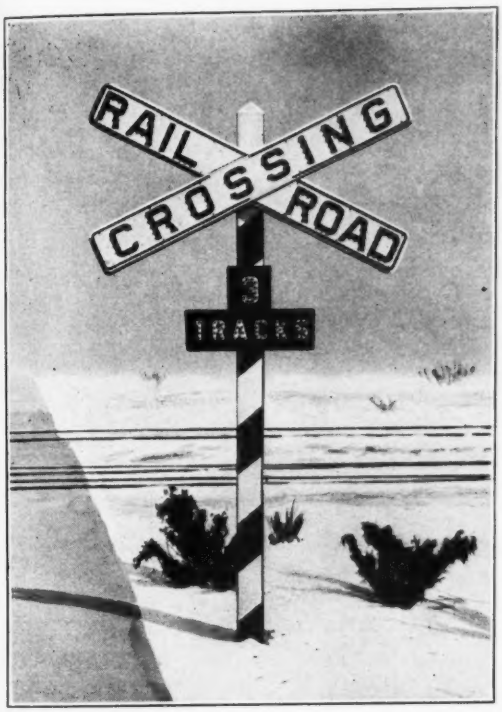
PROTECT ALL Your Crossings



Accidents at such crossings can be eliminated to a great extent by installing a PEERLESS REFLECTOR CROSSBUCK and TRACK SIGN, as shown.

These signs are visible both DAY and NIGHT.

At night the headlights of vehicles approaching crossings so equipped will cause the reflector buttons in these signs to become illuminated and flash a warning that a crossing is being approached. They are messages of warning IN TIME.

Resolve now to protect those unprotected crossings with this accident preventing and lifesaving equipment.

Write for Prices and Complete Data.

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LOUISVILLE, KENTUCKY

MORRISON *for* ECONOMIES *in* MAINTENANCE !

The

OSMOSE
Wood Preserving PROCESS

Is Particularly Suited To The Maintenance Needs of The Railroads

Photo shows Osmose groundline treatment on white oak piling of Illinois Central trestle, Chicago, Ill. Note the amount of decay removed before treatment (7 years after installation). Osmose preservatives applied by brush at the groundline penetrated to depths varying from ¾" to 1¼". It is now 2 years since groundline treatment was applied by railroad's own forces and NO FURTHER DECAY HAS DEVELOPED.

The Osmose Process is an economical and effective wood preserving method that procures deep penetration of universally accepted "salt" preservatives . . . through the medium of osmosis . . . without the need for mechanical pressure.

* * * * * **OSMOPLASTIC**

A toxic, bituminous, composition containing Osmose preservative salts . . . applied with a brush to places on wooden structures where moisture gathers.

OSMOPLASTIC is furnished in steel cans and drums. It will not wash off and the salts penetrate wherever sufficient moisture to foster decay is present.

EXCLUSIVE RAILROAD DISTRIBUTORS FOR THE OSMOSE CORPORATION OF AMERICA

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Write for information . . . no obligation. Ask about FREE TRIAL OFFER.

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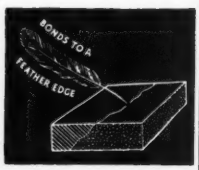

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STEEL TAPES

The light weight, perforated metal disk reel is rust-proof—it won't corrode or jam—no matter how tough the service—and can be easily cleaned of dirt accumulation. These sturdy, practical tapes remain the favorite of railway engineers, mining and construction men.

If you want to have one of the handiest, all-around steel tapes in engineer's pattern you ever owned, specify LUFKIN "WOLVERINE" to your supply dealer.

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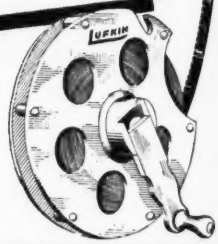

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TAPES — RULES — PRECISION TOOLS

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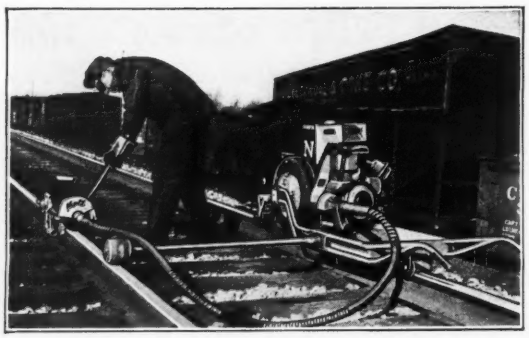
Mall TRADE MARK RAIL GRINDERS

A Type For Every Rail Maintenance Job!



Cross slotting with a MALL 5 H.P. gas engine combination grinder

Each MALL rail grinder and attachment is designed for a specific application and purpose—rail surface grinding, switch point, stock rail, frog, crossing grinding, and cross grinding; also, rail drilling, wood boring, and screw spike driving.

MALL rail grinders are engineered and built for long continuous service. These efficient tools pay for themselves within a few weeks of operation with lower maintenance costs.

Write for a descriptive folder describing the various units!

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Recommended Books on

RAILWAY ENGINEERING
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The list is divided into four sections:

I. Engineering and Track—5 pages
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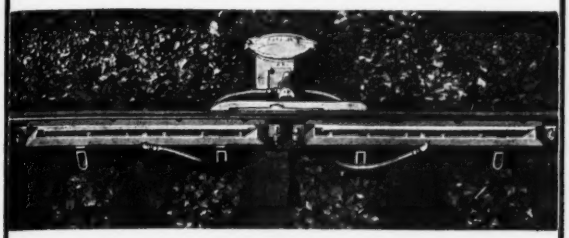
The pages are 8½ x 11 inches, mimeographed. Free on Request—Specify sections.

Book Service Department
Simmons-Boardman Publishing Corp.
30 Church Street, New York

(No. 1 of a series giving evidence supporting the statements enumerated in the March Issue)



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RAIL AND FLANGE LUBRICATORS

No. 1. Eliminate curve rail wear caused by wheel flange friction and increase life of rail two to four times.

The following quotations are from reports of MECO performance:

"If lubricators had not been installed, it would have been necessary to renew the rail on the sharp curve in two years or less. This rail (seven years later) is still in the track and shows very little wear beyond the original wear when MECOS were installed."

"The MECO has given such good protection that rail laid shortly after the MECO was installed shows practically no flange wear after five years. Formerly this curve rail was renewed every twelve to fifteen months. Traffic has been about the same over the past ten years."

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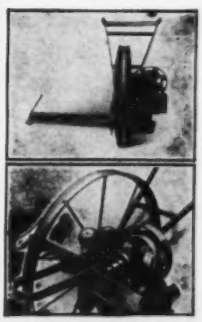

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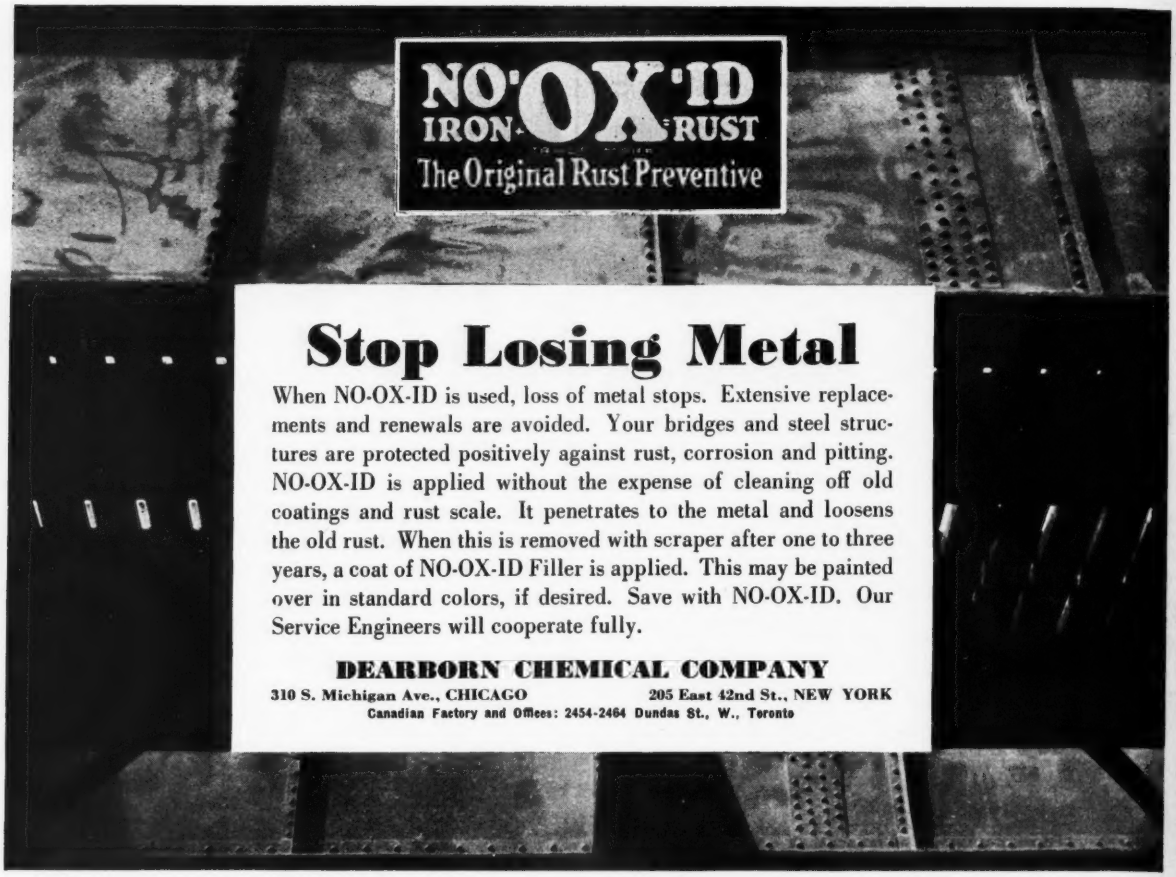
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